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SYSTEMS ANALYSIS: A POWERFUL BUT DANGEROUS WEAPON

BY

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Bachelor of Science

United States Naval Academy, 1952

A Thesis Submitted to the School of Government and Business Administration of The George Washington University in Partial Fulfillment of the Requirements for the Degree of Master of Business Administration

June, 1968

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CHAPTER I

INTRODUCTION

"It's much easier to be critical than to be correct."

From a speech by Benjamin Disraeli, February 11, 1851

The National Security Act of 1947, providing for the unification of the armed forces of the United States under a Secretary of Defense, initiated a series of reforms culminating with the installation of the Planning-Programming-Budgeting Concept in 1961 by Robert S. McNamara. With budgetary control, McNamara has accomplished what no prior Secretary of Defense could achieve: (1) integration of strategic plans and over-all defense programs within a program and budget structure, and (2) control of the military in a manner approaching absolute dominance.

The impact of the management skill of McNamara upon the defense establishment has obviously been profound. The controversy surrounding his work does not obscure the reasonable certainty that much of it will endure long after he has gone. As President Truman pointed out at the end of World War II in his Message to the Congress proposing a single Department of Defense: "...strategy, program and budget are all

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INTRODUCTION

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aspects of the same basic decisions."[1]

The rising waves of criticism directed at the programming system and "its partner in arms, systems analysis,"[2] cannot be easily dismissed as mere resistance to change. Much of the criticism directed at the scientific management techniques installed at the Pentagon during "McNamara's Management Revolution"[3] or "McNamara's Monarchy"[4] is deeply rooted in fear of overly centralized management. Charles J. Hitch, author of America's Economic Strength and co-author with Roland N. McKean of The Economics of Defense in the Nuclear Age, has been called the preacher of the new economics in the Pentagon. The latter book... "has been called the bible of the Pentagon, hailed by the new managers, but assailed by others as too mechanistic in its approach. Critics say it shows insufficient respect for the human factors that go into successful military defense planning."[5] In addition

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[1] Special Message to the Congress Recommending the Establishment of a Department of National Defense, December 19, 1945, Public Papers of the Presidents of the United States, Harry S. Truman, 1945, p. 551.

[2] Charles J. Hitch, Decision-Making for Defense, (Berkeley and Los Angeles, Calif,: University of California Press, 1965), p. 71.

[3] David Seligman, "McNamara's Management Revolution," Fortune, July, 1965, pp. 116-120 and 240-250.

[4] Hanson W. Baldwin, "McNamara's Monarchy," Saturday Evening Post, March 9, 1963, p. 8.

[5] Jack Raymond, Power at the Pentagon, (New York: Harper & Row, Publishers, 1964), pp. 302-303.

to the alleged over-centralization of defense management generally, Hitch cites two other often heard criticisms: first, that initiative and development of ideas from middle and lower levels of management are stifled, and second, that increased reliance on systematic quantitative analysis has acted to "downgrade" the role of military judgment.[6]

In this critical setting, this paper will review systems analysis as currently employed within the Department of Defense to assess the strengths and weaknesses on balance. The question which this paper attempts to answer is: What safeguards are required to assure that systems analysis or cost-effectiveness techniques do not unduly influence Defense program decisions--displacing, rather than aiding, conventional military wisdom with a systematized logic, structured and generated upon a knowledge of computers, probability theory and economics.

The Arrival of Systems Analysis within the Department of Defense

The years following World War II saw forces advocating change in two very significant areas: unification of the military establishment and reform of the Federal budget. Concern in these two areas was intensified by the cost, complexity and variety of modern military weapons which, in turn, have been found to have significant impact on national policy.

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[6]Hitch, op. cit., p. 60.

Prior to World War II, military technology changed slowly. Military experience could relate new weapons, which were essentially product improvements, to forces and in turn to strategy. "The bewildering array of entirely feasible alternative forces which our scientists can offer today has enormously acomplicated our problems of choice. There is hardly a military task which cannot be accomplished in a multitude of ways."[7] As a consequence, the planner on the highest level today can decide what he wants to achieve. With this leading question answered, he begins to design strategy appropriate to his goal, and then chooses the tools, the weapon systems, and their deployment to implement the strategy agreed upon.[8] "Strategic thought has by now overcome the reluctance to admit power as an element of national policy. The strict separation and division between policy and power has broken down so that Strategy now appears in its true, complete sense, so aptly expressed by General Albert C. Wedemeyer: "Grand Strategy is the art and science of employing all of a nation's resources to accomplish objectives defined by national policy."[9]

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[7]Russell Murray, Deputy Assistant Secretary of Defense for General Purpose Programs (Systems Analysis), "Systems Analysis and Cost Effectiveness," Defense Industry Bulletin, II, No. 9 (September, 1966), 1.

[8]Urs Schwarz, American Strategy: A New Perspective, (New York: Doubleday & Company, Inc., 1966), p. 127.

[9]Ibid., p. 126.

[illegible] to [illegible] War II, military technology changed slowly. Military experience could relate new weapons, which were developed to product improvements, to forces and to doctrine. The very idea of entirely feasible alternative forces which one scientists could often barely [illegible] was unprecedented. Today a military race which cannot be accomplished in a century. [illegible] As a consequence, the planner on the highest level today may decide what he wants to achieve. [illegible] He begins to develop technology appropriate to his goal, and then discovers the tools, the weapon systems, and force deployments to implement the strategy agreed upon.[7] "Strategic theory is one by now overcome the reluctance to accept power as an element of national policy. The actual employment and relation between policy and power has broken down so that [illegible] now appears in its true, complete sense, as explained by General Albert C. Wedemeyer: 'Grand Strategy is the art and science of employing all of a nation's resources to accomplish objectives defined by national policy.'[8]

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[7]Russell Murray, Deputy Assistant Secretary of Defense for General Purpose Programs ("Systems Analysis and Cost Effectiveness," Columbia Industry Bulletin, II, No. 9 (September, 1[illegible]), 1.

[8]Core Schwartz, Nuclear Strategy & Navy Perspective, (New York: Doubleday & Company, Inc., 1964), p. 15.

[9]Ibid., p. 15.

When President Truman proposed unification of the military services to the Congress in 1947, he stated, "we should have integrated strategic plans and a unified military program and budget."[10] Subsequently, President Eisenhower in a special message to Congress on the 1958 reorganization of the Department of Defense stressed: "It is... mandatory that the initiative for this planning and direction rest not with the separate services but directly with the Secretary of Defense and his operational advisors..."[11] The reorganization of 1958 and the amendments to the National Security Act of 1949 creating the Office of Assistant Secretary of Defense (Comptroller) recognized the need for changes at the administrative level, but integration of the military at the resource level had not occurred.

Prior to 1961, despite many innovations and reforms in the financial management in the Department of Defense and the separate military departments, the Secretary of Defense did not integrate his military planning with his resource requirements or budget.[12] Budgetary reform in the United States has evolved through three distinct stages. In the initial stage, the primary emphasis was on central control of spending

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[10]David Novick, (ed.) Program Budgeting: Program Analysis and the Federal Budget, A RAND Corporation publication, (Washington: U.S. Government Printing Office, 1965), p. 51.

[11]Hitch, op. cit., p. 22.

[12]Novick, op. cit., p. 51.

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[12]Davis Dresher, (ed.) Planning-Programming-Budgeting: Problems, Analysis and the Federal Budget, A RAND Corporation publication, (Washington: U.S. Government Printing Office, 1965), p. 91.

[13]Ibid., op. cit., p. 17.

[14]Hitch, op. cit., p. 81.

and the budget was utilized to guard against administrative abuses. The detailed classification of objects of expenditure was the main control mechanism. The second stage was management-oriented. It was concerned with the efficient performance of work and prescribed activities. The performance budget, officially introduced by the Hoover Commission in 1949, recommended..."that the whole budgetary concept of the Federal Government... be refashioned by the adoption of a budget based on functions, activities, and projects."[13] The Hoover Commission was concerned with improving Congressional review of the budget. To this end, the amendments to the National Security Act in 1949 provide that the Department of Defense prepare, present, justify and, where practical, administer authorized programs so as to account for, and report, the cost of performance of readily identifiable functional programs and activities, segregating operating and capital programs.[14] The last stage of budgeting reform is associated with Planning-Programming-Budgeting and... "is reflected in the planning orientation of the new PPB system. It had roots in Keynesian economics and the new technology of systems analysis."[15] With emphasis on

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[13]Jesse Burkhead, Government Budgeting, (New York: John Wiley & Sons, Inc., 1956), p. 135.

[14]Ibid., p. 135 and 136.

[15]Allen Schick, "The Road to PPB: The Stages of Budget Reform," Public Administration Review, December, 1966, p. 243.

and the budget was utilized to serve several administrative purposes.

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[13]Jesse Burkhead, Government Budgeting, (New York: John Wiley & Sons, Inc., 1956), p. 153.

[14]Ibid., p. 156 and 336.

[15]Allen Schick, "The Road to PPB: The Stages of Budget Reform," Public Administration Review, December, 1966, p. 243.

the planning aspects, PPB has two primary aims: first, to permit analysis of total force structure for all the services in terms of common missions or national objectives; second, to project the resource impact or cost of the proposed force structures over an extended period of time.

As the technological revolution in military weapons affected thinking concerning unification, budget and strategy at the national level; this same revolution, through the medium of research, sponsored primarily by the military, gave rise to a whole new industry. Major colleges and universities and non-profit organizations were actively competing for a portion of the Defense budget to conduct research and analysis on military and national security matters. To gain an appreciation of the magnitude of this new industry consider that... "there are, in all, about three hundred and fifty non-profit organizations, three hundred research centers at universities, and more than a thousand research organizations of industrial companies and private foundations engaged in solving problems more or less related to military security and strategy."[16] This growth is even more significant considering that... before 1940, practically all the specialized intellectual work of the government was done "in-house" by government laboratories."[17] A government survey in 1963 reported that the University of Notre Dame

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[16]Schwarz, op. cit., p. 131.

[17]Raymond, op. cit., p. 145.

[illegible]

[illegible]

[illegible]

received one-sixth of its total operating expenditures for education and general purposes from Federal funds; two dollars of every three spent for engineering and science research came from the government. The same survey ranked the Massachusetts Institute of Technology twenty-first in the 1962 list of profit-making prime contractors in defense research and development with $74,956,000 in grants and contracts.[18]

The new community produces ideas. The most famous of the "think" organizations is the RAND Corporation which was ordered organized and subsidized by General Henry H. Arnold, Chief of the Air Corps during W W II, to "get the best brains and turn them loose on the problems of the future."[19] Originally set up as an independent division of Douglas Aircraft Company in 1946, RAND became an independent non-profit corporation in November, 1948, with funds supplied by the Ford Foundation. Employing a professional staff of 650, of whom 550 are of top rank in the fields of natural and political science, economics, social science, systems operations, physics, engineering and mathematics, RAND conducts studies of broad scope from politics and guerrilla warfare to astronautics, 90 percent of which are directed by the Air Force.[20] The Army and Navy have their equivalents of RAND, and, in 1956, the Defense Department subsidized the Institute for

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[18]Raymond, op. cit., pp. 138-139.

[19]Raymond, op. cit., p. 145.

[20]Schwarz, op. cit., p. 109.

[16]Raymond, op. cit., pp. 125-126.

[15]Raymond, op. cit., p. 143.

[14]Schwarz, op. cit., p. 102.

Defense Analysis. One of the attractions for the Defense Department was the ability to hire scientists and technicians at rates of pay substantially above Federal salary scales.[21]

The interpenetration of the military by the civilian has grown rapidly. Military officers, looking back on a tradition of isolation from the rest of the nation which was inclined to consider the science of military knowledge as a pastime, sporadically and superficially, should have some misgivings concerning too large a penetration of the civilian element into their world. Failure to achieve unification in fact, in spite of organizational measures to support unity, has been cited as a singular failure of the military profession and has allowed the lay strategist the occasion to invade the area of military affairs.[22]

Commencing in 1953, RAND Corporation published a continuing series of memorandums on systems analysis, cost effectiveness analysis and program budgeting. Additionally, during 1955 and 1959, RAND offered intensive five-day courses entitled "An Appreciation of Analysis for Military Decisions" to military officers and civilians associated with the armed forces. It was basically an analytic approach to long-range military planning.[23] During this same period, a number of RAND

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[21]Raymond, op. cit., p. 148.

[22]Schwarz, op. cit., p. 133.

[23]E. S. Quade (ed.), Analysis for Military Decisions, (Santa Monica, Calif.: The RAND Corporation, November, 1964), p. V.

economists (including Smithies, Novick, and McKean) began to urge reform of the Federal budget system.[24] Much of this work resulted in publication of The Economics of Defense in the Nuclear Age by Hitch and McKean. This book must have come to the attention of McNamara through his interest in planning and management sciences,[25] "and probably was responsible for Hitch's appointment as Assistant Secretary of Defense (Comptroller)."[26] "Thus, by 1960 there was a general recognition of the need for change. The conceptual tools had been developed. Congressional leaders had expressed desire for reform, and many military officers were ready and able to participate in the program. The arrival of McNamara as Secretary of Defense in January 1961 resulted in a concerted and intensive effort to focus these new developments on the vital and complicated issues of U.S. national security in the 1960's."[27] A program budget, including a proposed format is contained in Chapter 4 of The Economics of Defense in the Nuclear Age and provided the blueprint for McNamara's Management Revolution. "As

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[24]Schick, op. cit., p. 251.

[25]Novick, op. cit., p. 57.

[26]Raymond, op. cit., p. 303.

[27]Samuel A. Tucker (ed.), A Modern Design for Defense Decision, "A McNamara-Hitch-Enthoven Anthology," (Washington, D.C.: Industrial College of the Armed Forces, 1966), p. 6.

economies (including facilities, tools, and skilled) open to wage
returns of the Federal budget system.[34] Much of this work resulted in
publication of The Economics of Defense in the Nuclear Age by Hitch
and McKean. This book could have come to the attention of McNamara
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[34]Enthoven, op. cit., p. 395.

[35]Novick, op. cit., p. 84.

[36]Raymond, op. cit., p. 303.

[37]Harold A. Linder (ed.), A Modern Design for Defense Decision
(Washington, D.C.: Industrial College of the Armed Forces, 1966), p. 8.

the first Secretary of Defense educated in the modern tools of management analysis, he made it clear to the Department that he wanted all its problems approached in a logical, analytical way."[28] The current planning-programming-budgeting procedures and concepts of systems analysis have already proved so useful that President Johnson in August 1965 directed their extension on a Government-wide basis "to present us with the alternatives and the information on which...(to)...make better decisions."[29]

The Rising Tide of Criticism

With all the benefits and achievements ascribed to PPB and systems analysis, criticism still mounts daily. "Concluded one industrialist with a long background of Military experience: "There is nothing new about cost-effectiveness. It has always been around. The difference is that today it is the big item and yesterday it was just an item... What, after all, is the true measure of cost-effectiveness? In time of peace it can be a constant game and the cost-effectiveness experts can shine like stars. But, in time of war or other unnamed hostilities, the true measure is, "How are we doing?" In short, how are our cost-effective weapons making out on the battlefield? Here is where it counts--not in some drill, not on paper and not in Congressional

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[28] Ibid.

[29] Ibid., p. 7.

[illegible]

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[illegible]

hearings. It's what's up front that counts."[30]

Inherent in the systems analysis approach is the ability to formulate or design the problem; to choose appropriate objectives; to define the relevant, important environments or situations in which to test alternatives; to judge the reliability of cost and other data; and finally, but not least, the ingenuity to invent new systems or alternatives to evaluate. Throughout this process, no matter how detailed or empirical the data supporting a request may be, human factors permeate the entire sequence. "Judgment is always of critical importance in designing the analysis, choosing the alternatives to be compared, and selecting the final course of action. The manager does not allow himself to become a slave to a certain investment cutoff level, for example, no matter how quantitatively exact its derivation may be."[31]

The primary indictment of the present centralized process, however, according to Stephen Enke, is its failure to be an effective instrument of continued change. The fear expressed here stems from the rigidity of the program change proposal chain and the sluggishness of the system to accept change. This suggests that the increased centralization of defense management may already be having a detrimental effect upon the morale and judgment of lower level managers, not to

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[30]C. W. Borklund, "Is the U.S. Already Embarked On Unilateral Disarmament?", Armed Forces Management, November, 1967, p. 76.

[31]Donald J. Smalter and Rudy L. Ruggles, Jr., "Six Business Lessons from the Pentagon," Harvard Business Review, Vol. 44, No. 2, (March-April 1966), p. 71.

affect upon the morale and judgment of lower level managers, not to

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[illegible] Boehland, "Is the U.S. Already Embarked On Unlimited Disarmament?", Armed Forces Management, November, 1967, p. 76.

[illegible] Donald C. Bossidy and Hardy L. Hopkins, Jr., "Six Business Lessons from Vietnam," Harvard Business Review, Vol. 44, No. 2, (March-April 1966), p. 71.

mention national security interests.[32] Another criticism of the centralization of authority is the fear that it silences the possible voices of dissent by the military reducing arguments that must be offered and heard.[33]

One of the most often heard criticisms is the suspicion that, somehow or other, cost effectiveness studies put "dollars before national security," or will result in the U.S. going to war with "cut-rate, cut quality, cheapest-to-buy weapons."[34] With the current emphasis on cost effectiveness, the military is being requested to procure only proven systems which can be costed. In the words of General Bernard A. Schriever, Commander, Air Force Systems Command until August, 1966, "all of the great developments of this century are the products of invention, not prediction. Wishful thinking has never produced an ounce of hardware or an iota of defense."[35]

Among criticism from Congress are comments by Senator Henry M. Jackson (D-Wash.) to the extent that systems analysis and cost effectiveness studies have been greatly oversold and bedeviled with difficulties. "The abuse of cost-effectiveness studies is well known to those of us who serve in the various committees of the Congress. Cost

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[32]Stephen Enke, Defense Management, (Englewood Cliffs, N.J.: Prentice-Hall, 1967), p. 1c.

[33]Raymond, op. cit., p. 293.

[34]Hitch, op. cit., p. 43.

[35]C. W. Borklund, "Cost-Effectiveness vs. Creativity: Part II." Armed Forces Management, September, 1967, p. 5c.

Prentice-Hall, 1977), p. 1.

[illegible], op. cit., p. 197.

[illegible], op. cit., p. 42.

[illegible]. Cost-Effectiveness vs. Creativity: Part II."
Defense Systems Management, September, 1977, p. 26.

utility analysis can be used as easily to justify a decision as to make a sensible chioce. It can be employed as a weapon to try to overwhelm and beat down other viewpoints. And no idea is so good that it cannot be killed by over-analysis."[36]

A summation of middle management criticism within the Pentagon is given in the following six points:

> 1-The lack of major push behind promising new weapon developments will weaken seriously the nation's military posture within a decade when that strength will be needed most.
>
> 2-Really dynamic innovation has been effectively discouraged, either by design or default.
>
> 3-The military contribute to their own ailments by asking for half a loaf (informally to see if it is acceptable) rather than all of what they are convinced they need, mainly out of fear that if they push for the total program, they will end up with nothing at all.
>
> 4-Most of the so-called "new" procurement has really been buying of obsolescence and calling it progress.
>
> 5-The non-decision-making in new weaponry makes no logical sense if played against the longstanding policy pronouncement that the Nation can afford "whatever is necessary for national security" unless;
>
> 6-It is first assumed that the present leadership is purposely embarked on a program of <u>not</u> maintaining the strongest military force possible, the idea being that military strength is a destabilizing influence "which can provoke wars."[37]

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[36]U.S. Congress, Subcommittee of the Committee on Government Operations, Hearings, Planning-Programming-Budgeting, 90th Cong. 1st. Sess., 1967, p. 66.

[37]Borklund, "Is the U.S. Already Embarked On Unilateral Disarmament?", <u>op. cit.</u>, p. 73.

The range, sources, and frequency of criticism of system analysis has been serious enough to start several Congressional inquiries. The criticism, instead of diminishing after the speed with which PPB and systems analysis were installed within the DOD, has continued to mount over a period of seven years. In an effort to test the validity of criticism, this thesis will explore the concepts, methods, strengths and weaknesses of systems analysis and review several of the controversial decisions which involved the Congress. As previously stated, the purpose of the writer is to determine what safeguards are necessary to assure that systems analysis within the Department of Defense is, in fact, a viable part of the decision-making process.

CHAPTER II

SYSTEMS ANALYSIS—A STRUCTURAL APPROACH

"If systems analysis isn't synonymous with PPBS, what is it?"

Samuel M. Greenhouse[1]

Some Definitions

E. S. Quade, who compiled the RAND Corporation lectures on systems analysis says it "is still largely a form of art" in which it is not possible to lay down "fixed rules which need only be followed with exactness."[2] Broadly defined it is any analytic study designed to aid a decisionmaker identify a preferred choice from among possible alternatives. Attempts to precisely define the concept out of context from the specific system or category of problems to which it is applied, has proved difficult for even its most renowned practitioners.

Aaron Wildavsky, noted writer and political economist, offers an incisive description of the systems analysis technique employed in the Pentagon today. He indicates that creativity and innovation are the essential elements; such pat processes as matching means to ends or

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[1]Samuel M. Greenhouse, "The Planning-Programming-Budgeting System: Rationals, Language, and Idea-Relationships," Public Administration Review. (December, 1966), p. 276.

[2]E. S. Quade (ed.), Analysis for Military Decisions, (Santa Monica, Calif.: The RAND Corporation, November, 1964), p. 153.

CHAPTER II

SYSTEMS ANALYSIS: A MULTIDISCIPLINARY APPROACH

If systems analysis isn't synonymous with [illegible], what is it--

[illegible] Its Definitions

[illegible] and considered the RAND Corporation [illegible] systems analysis have it [illegible] a form of art. In reality it is [illegible] to say these [illegible] only [illegible] with reasonable. [illegible] Probably defines it in any analytic study [illegible] to aid a decisionmaker [illegible] a difference exists [illegible] possible alternatives. Although to previously [illegible] out of context from the specific system or objective of [illegible] it is applied, may prove difficult for even the most renowned practitioners.

Aaron B. Wildavsky, noted writer and political economist, offers an inclusive description of the systems analysis technique employed in the Pentagon today. He indicates that creativity and innovation are the essential elements; even [illegible] as [illegible] seems to [illegible] or

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[1]Samuel M. Drezanovic, "The Planning-Programming-Budgeting System: Rationale, Language, and Idea-Relationships," Public Administration Review, (December, 1966), p. 272.

[2]E. S. Quade (ed.), Analysis for Military Decisions, (Santa Monica, Calif.: The RAND Corporation, November, 1964), p. 115.

fitting ends to match means are ordinarily avoided, preferring instead to relate elements imaginatively into new systems which create their own means and ends. New objectives are continuously played against cost elements until a creative synthesis is achieved. Given objectives are not considered constraints since their solidity dissipates under analysis. Wildavsky infers that people do not know what they want because they do not know what they can get. Since no one knows how to teach creativity, it is not surprising that no one can define what systems analysis is or how it should be practiced.[3]

The initial Memorandum of the Jackson subcommittee of the U.S. Senate Committee on Government Operations holding hearings on Planning-Programming-Budgeting included the following in its opening remarks:

> Systems analysis is intended to present decision-makers with a systematic and comprehensive comparison of the costs and benefits of alternative approaches to a policy goal, taking advantage of techniques variously described as operations research or cost-effectiveness studies. There is an emphasis on quantitative analysis. Computers have make it possible to handle large quantities of data and applied mathematics has provided ingenious statistical techniques for dealing with some kinds of uncertainty.
>
> Some of the less historically-minded proponents of PPBS strongly imply that it is something brand new, providing decision-makers for the first time with a rational basis for choosing between alternative policies. Actually, cost-benefit analysis seems to have begun in the Garden of Eden (see Genesis, 3), and the problem from the outset has been to avoid an underestimation of costs and an overestimation of benefits. Costs and gains have been compared throughout our government's history whenever a decision to spend or not to spend had to

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[3]Aaron Wildavsky, "The Political Economy of Efficiency: Cost-Benefit Analysis, Systems Analysis, and Program Budgeting," Public Administration Review, (December, 1966), p. 298.

making made to match means are rationally avoided, preferring instead to relate elements imaginatively into new systems which create their own means and ends. Here objectives are continuously played against cost elements until a creative equilibrium is achieved. Given objectives are not considered constraints since their validity dissipates under analysis. Objectives tell people to not know what they want because they do not know what they can get. Since no one knows how to teach creativity, it is not surprising that no one can define what systems analysis is or how it should be practiced.[7]

The initial discouragement of the Jackson subcommittee of the U. S. Senate Committee on Government Operations holding hearings on Planning-Programming-Budgeting reflected the following in its opening remarks:

> Systems analysis is intended to present decision-makers with a systematic and comprehensive comparison of the costs and benefits of alternatives responsive to a policy goal, having advantage of increased rationality described as contributing research or cost-effectiveness studies. There is an emphasis on quantities analysis. Computers have made it possible to handle large quantities of data and applied mathematical and statistical techniques for dealing with some kind of uncertainty.
>
> Some of the less optimistic estimates of PPBS strongly imply that it is something grand new, providing decision-makers for the first time with a rational basis for choosing between alternative policies. Actually, cost-benefit analysis seems to have begun in the Garden of Eden (see Genesis 3), and the problem from the outset has been to avoid an underestimation of costs and an overestimation of benefits. Costs and gains have been considered throughout our governmental history whenever a decision to spend or not to spend had to

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[7] Aaron Wildavsky, "The Political Economy of Efficiency: Cost-Benefit Analysis, Systems Analysis, and Program Budgeting," Public Administration Review, (December, 1966) p. 292.

> be made, and Congress explicitly called for cost-benefit studies as far back as the Rivers and Harbors Act of 1902. Operations research demonstrated its usefulness in World War II. Statistical control, pushed by Robert Lovett as Assistant Secretary of War for Air in World War II, was the forerunner of many functions of the Comptroller of the Defense Department and a predecessor of systems analysis. The idea of performance or program budgeting can be traced back at least to President Taft's Commission on Economy and efficiency, which published its path-breaking report, "The Need for a National Budget," in 1912. And program budgets for periods extending well into the future have long been the rule in progressive banks and business firms.
>
> PPB may for the first time identify these techniques as a "system," give them a special name and advertise them, but the approach itself is as old as the problem of the buyer who would like to make two purchases and has money only for one.[4]

Dr. Alain C. Enthoven, Assistant Secretary of Defense (Systems Analysis), who testified before the Jackson subcommittee on various occasions has given several definitions of what he considers systems analysis to be:

> ....systems analysis is just one name for an approach to problems of decision making that good management has always practiced. The essence of systems analysis is not mysterious, not particularly complicated, nor entirely new, nor of special value only to the Defense planning. Rather, it is a reasoned approach to highly complicated problems of choice characterized by much uncertainty; it provides room for very differing values and judgments; and it seeks alternative ways of doing the job....[5]
>
> Systems analysis is an effort to define the issues and alternatives clearly, and to provide responsible officials with a full accurate, and meaningful summary of as many as possible of the relevant facts so that they can exercise well-informed

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[4]U.S. Congress, Subcommittee of the Committee on Government Operations, Hearings, Planning-Programming-Budgeting, 90th Cong. 1st Sess., 1967, p. 12.

[5]Ibid., p. 72.

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PPB may for the first time identify these techniques as a "system," give them a special name and advertise them, but the approach itself is as old as the problem of the buyer who would like to make two purchases and has money only for one.[4]

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[4] U.S. Congress, Subcommittee of the Committee on Government Operations, Hearings, Planning-Programming-Budgeting, 90th Cong. 1st Sess., 1967, p. 12.

[5] Ibid., p. 74.

judgment; it is not a substitute for judgment.[6]

Systems analysis is a method of interrogation and debate suited to complex, quantitative issues. Systems analysis is a set of ground rules for constructive debate; it gives the participants useful guidelines for proceeding to clarify and resolve disagreements.[7]

What is systems analysis? I have not been able to produce a good brief definition. I would describe the art, as it has evolved in the Department of Defense, as a reasoned approach to problems of decision. Some have defined it as "quantitative common sense." Alternatively, it is the application of methods of quantitative economic analysis and the scientific method, in the broadest sense, to the problems of choice of weapon systems and strategy. It is a systematic attempt to provide decision-makers with a full, accurate, and meaningful summary of the information relevant to clearly defined issues and alternatives.[8]

Where does this leave us? What is operations research or systems analysis at the Defense policy level all about? I think that it can best be described as a continuing dialogue between the policy-maker and the systems analyst, in which the policy-maker asks for alternative solutions to his problems, makes decisions to exclude some, and makes value judgments and policy decisions, while the analyst attempts to clarify the conceptual framework in which decisions must be made, to define the alternative possible objectives and criteria, and to explore in as clear terms as possible (and quantitatively) the cost and effectiveness of alternative courses of action.

The analyst at this level is not computing optimum solutions or making decisions. In fact, computation is not his most important contribution. And he is helping someone else to make decisions. His job is to ask and find answers to the questions: "What are we trying to do?" "What are the alternative ways of achieving it?" "What would they cost, and how effective would they be?" "What does the decision-maker need to know in order to make a choice?" And to collect and organize this information for those who are responsible for deciding what the Defense

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[6]Ibid. (underlining supplied)

[7]Ibid., p. 12.

[8]Tucker, op. cit., p. 161.

program ought to be.[9]

The above list of definitions is by no means complete. One will find as many definitions as there are publications devoted to describing systems analysis and its role in PPB. One method, the one this writer chooses, is to describe the structural framework for decision making which has evolved within the Department of Defense since 1961.

Planning-Programming-Budgeting

Although one could trace the basic concepts of program budgeting, historically, as the initial Memorandum of the Jackson subcommittee did, the origins and indeed the blueprints for PPB within the Defense Department were presented in two documents from the RAND Corporation: one, The Economics of Defense in the Nuclear Age; the other, New Tools for Planners and Programmers.[10] The RAND Corporation which had been studying and publishing information on the program budget since 1953, brought this concept to the attention of persons in the incoming Kennedy Administration who generally agreed that this might be the one way of facilitating the treatment, analysis, and study of one large segment of the United States budget, namely, the military components.[11]

Prior to 1961, military planning and budgeting were performed

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[9]Novick, "Program Budgeting: Program Analysis and the Federal Budget," op. cit., p. 89.

[10]David Novick, (Santa Monica, Calif.: The RAND Corporation, December, 1960).

[11]David Novick, Origin and History of Program Budgeting, (Santa Monica, Calif.: The RAND Corporation, October, 1966), p. 7.

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Prior to 1961, military planning and budgeting were performed

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[9]Novick, "Programs Budgeting: Program Analysis and the Federal Budget," op. cit., p. 29.

[10]David Novick, (Santa Monica, Calif.: The RAND Corporation, December, 1950).

[11]David Novick, Origin and History of Program Budgeting, (Santa Monica, Calif.: The RAND Corporation, October, 1966), p. 7.

independently. Planning, the responsibility of the Joint Chiefs of Staff (JCS) and the military departments, was accomplished in terms of military forces and weapon systems, projected over a period of years. Costs, generally speaking, were not introduced systematically, either to test the feasibility of the whole program or to evaluate the relative merit of the allocation. Budgeting on the other hand, was limited by total dollar estimates that the economy could or should bear. The budgetary system identified cost by object classes or resource categories: (1) Military Personnel; (2) Operation and Maintenance; (3) Procurement; (4) Research, Development, Test and Evaluation; and (5) Military Construction. In effect, the budget reflected inputs to the Defense Department and gave little indication as to possible outputs such as Army divisions, Air Force wings or weapon systems and military forces.

The result was a gap. The "required" forces always cost more than the Administration and Congress were willing to pay. The process was unsystematic and wasteful and, in addition to providing unbalanced forces, was a principal cause of service rivalry. General Maxwell D. Taylor, Army Chief of Staff during the Eisenhower Administration, resigned after policy disputes concerning the future role of the Army and the Administration policy of massive retaliation. In his book, The Uncertain Trumpet, Taylor succinctly expressed the problem in these words:

> The three services develop their forces more or less in isolation from each other, so that a force category such as strategic retaliatory force, which consists of contributions of both the Navy and the Air Force, is never viewed in the aggregate.... In other words, we look at our forces horizontally when we think of combat functions, but view them vertically in developing the defense budget.[12]

Other critics hoped that more meaningful fiscal presentations would permit reductions in the Defense budget and more rational use of resources. The House Appropriations Committee reported in 1959 that the Joint Chiefs of Staff should look at joint missions and combined capability.[13] The following year, the same Committee showed its concern with the duplication and false starts of research and development where major weapons were committed to full production prior to completion of evaluation. The Senate Preparedness Subcommittee and the Committee on Government Operations in 1959 and 1960 recommended that, despite unification, testimony shows that the 1960 budget never considered, nor were decisions made, on a functional basis concerning missions, but were based on individual service targets. Additionally, the lack of forward planning and failure to establish priorities between programs was poor business practice. The reports stated that Government must extend its budgetary time horizons further into the future.[14]

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[12]Maxwell D. Taylor, The Uncertain Trumpet, (New York: Harper and Bros., 1959), p. 132.

[13]Tucker, op. cit., p. 4.

[14]U.S. Congress, Subcommittee of the Committee on Government Operations, Hearings, Planning-Programming-Budgeting, 90th Cong. 1st Sess., 1967, pp. 68-69.

The three services severely strained their forces and lost in [illegible] from each other, so that a force category such as [illegible] retaliatory forces, which consists of contributions of both the Navy and the Air Force, is never viewed in the [illegible] ... In other words, we look at our forces horizontally [illegible] rather than vertically, in terms of [illegible] functions.

Other services argued that more meaningful threat projections would permit reductions in the Defense budget and more rational use of resources. The Rogers Appropriations Committee reported in 1969 that the Joint Chiefs of Staff should look at joint missions and combined capability.[13] The following year, the same Committee showed its concern with the duplications and false starts of research and development where major weapons were committed to full production prior to completion of evaluation. The Senate Preparedness Subcommittee and the Committee on Government Operations in 1969 and 1970 recommended that, despite unification, testimony show that the 1970 budget never considered, nor were decisions made, on a functional basis comparing missions, but were based on incremental service buys. Additionally, the lack of formal planning and failure to establish priorities between programs was poor business practice. The report stated that Government could extend its machinery time horizon further into the future.[14]

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[13]Maxwell D. Taylor, The Uncertain Trumpet, (New York: Harper and Bros., 1960), p. 139.

[14]Tweter, op. cit., p. 4.

[15]U.S. Congress, Subcommittee of the Committee on Government Operations, Hearings, Planning-Programming-Budgeting, 90th Cong. 1st Sess., 1967, pp. 85-89.

McNamara in preparation for becoming Secretary of Defense read various Congressional reports and cited specifically the 1960 Jackson Committee recommendation for more vigorous implementation of the broad powers vested in the Secretary of Defense."[15] Considering the criticism of the present system and "President Kennedy's instructions... to (1) develop the force structure necessary to meet our military requirements without regard to budget ceilings; and (2) procure and operate this force at the lowest possible cost," McNamara sought an alternative so that he could allocate funds to the services on the basis of the overall needs of national security and thus provide the country with a balanced military posture.

Both McNamara and Hitch realized that to make the really crucial decisions concerning major forces and weapon systems, the financial management area had to provide data upon which these decisions could be based. It was clear that a new function would have to be incorporated into the financial structure. The answer proposed by Hitch in the spring of 1961, was called programming. "Since the military planning function and the budget function were already well established, the role of programming was to provide a bridge between the two."[16]

Dominating the new concept formulation was the recognition that the great technical complexity of modern weapon systems, the lengthy

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[15]Tucker, op. cit., p. 12.

[16]Hitch, "Decision-Making for Defense," op. cit., p. 29.

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[5]Tucker, op. cit., p. 12.

[6]Hitch, "Decision-Making for Defense," op. cit., p. 74.

development and procurement time, and enormous costs place a tremendous premium on the selection process. These choices have become, for the top management of the Defense Department, the key decisions around which much else of the Defense program revolves.[17]

Seven broad goals were established for programming, and since this function is regarded as paramount, they establish the parameters for Planning-Programming-Budgeting. The goals include: (1) planning around major missions as opposed to grouping military forces of the services separately; these mission-oriented forces constitute the "outputs" of the defense program; (2) ability to relate resource "inputs" to military "outputs"; this constitutes a time-phased requirement in terms of physical units, such as manpower, equipment and facilities; (3) coordination of long-range planning with budgeting to allow for changes to approved programs recognized or required during the budget review process; (4) continuous appraisal of programs since defense planning must remain flexible and responsive to military needs rather than geared to the annual budget cycle; (5) progress reporting to assure that timely, corrective action can be taken if significant deviations to approved plans occur; (6) an ability to make cost-effectiveness studies of alternate force structures; and (7) development of an integrated OSD management system since the programming system imposes heavy

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[17]Tucker, op. cit., p. 65.

1/ Brown, op. cit., p. 45.

requirements for information from the services.[16]

The Five-Year Force Structure and Financial Plan is an internal Defense Department tool, though it is the foundation of the programming system, it does not represent approved programs of the U.S. Government. The Congress reserves to itself the right to authorize and appropriate funds, year by year, against this proposed program, and even the President is not unalterably committed to the five-year program in detail. It is, however, the road map. It establishes and projects the forces for each military service for eight years and resource levels for five years. When the plan is formally approved by the Secretary of Defense, it becomes binding for programming purposes on all components of the Department.

The Five-Year Program can be described in terms of three major building blocks:

1. Major Programs representing aggregations of similar military missions and supporting functions of the military services into eight broad functional classifications:

   I -Strategic Retaliatory Forces

   II -Continental Air and Missile Defense Forces

   III -General Purpose Forces

   IV -Airlift and Sealift

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16. U.S. Department of Defense, Study Report on the Programming System for the Office of the Secretary of Defense. (Washington: Office of the Assistant Secretary of Defense (Comptroller), June 25, 1962), pp. I-2 and I-3.

U.S. Department of Defense, Good Decent in the Incorporation
of the Assistant Secretary of Defense (Comptroller), June 30, 1953),
pp. I-2 and I-3.

V -Reserve and Guard

VI -Research and Development

VII -General Support

VIII -Military Assistance

(Retired Pay, once a program, is separately handled since it represents costs fixed by law and beyond the direct control of the Secretary of Defense.)

All of the program data, together with the description of the forces, their tasks and missions are machine processed and can be summarized in different ways. By preparing a matrix table containing the major programs in the column headings and the traditional budget categories (appropriations) in the stub, the Five-Year Program can be translated into budget terms and vice versa.[19]

2. Program Elements are the forces, weapon (or support) systems, and similar types of integrated activities within a major program, by means of which the missions are accomplished. As an example, the program elements that make up Program I: Strategic Retaliatory Forces include long-range bombers, the air-to-ground and decoy missiles, and the refueling tankers; the land-based and submarine-based missiles; and the systems for their command and control.[20] All program elements of which there are over 600, collectively constitute

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[19]Tucker, op. cit., pp. 92 and 93.

[20]Novick, "Program Budgeting: Program Analysis and the Federal Budget," op. cit., p. 59.

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the complete planned output of the Defense Department. The forces are projected eight years beyond the current year, three years more than the rest of the program element data. Since decisions are made by program element and each DOD activity falls within one and only one program element, costs are broken down into three broad categories: Research and Development; Investment; and Operating. Under each of these cost categories are listed the budget appropriation accounts from which the program element is financed. In this manner costs associated to programs and forces can be extrapolated to budget terms.

3. Resource categories are the required resource inputs which make up the program elements. There are four major resource categories: (1) items of equipment, (2) manpower, (3) military construction and (4) the functions and activities financed under Operation and Maintenance appropriations. Just as in the case of program elements, the sum of all resource categories equals total resource input since every resource input falls within one and only one resource category.[21]

Thus in one comprehensive format, The Five-Year Force Structure and Financial Program, are represented the planned defense forces and their costs identified to the budget categories and projected over time. All the relevant information needed to make sound decisions have been provided to the Secretary of Defense and his principal military

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[21]The Navy Programming Manuel, Office of the Chief of Naval Operations (OPNAV 90P-1, June 11, 1965, and changes), p. 1-3-1.

Operations (CINCLANT FLEET, June 11, 1962, and changes), p. 1-3-1.

and civilian advisors. The budget is in balance with programs, programs with force requirements, force requirements with military missions, and military missions with national security objectives. The impact of change and its overall effect on other programs and forces with the attendant dollar cost can be readily computed.[22]

Since the defense program is a dynamic system, a formal change proposal system was incorporated to provide for change and to assure that approved programs were kept within approved limits. This device, the Program Change Request (PCR) helps ensure:

1. that there is only one channel for major decision-making:
2. that proposed changes receive a rapid, but complete, review by all parties concerned:
3. that program decisions are made on the basis of the best information available, including a validation of their long-range cost implications:
4. that all major changes are made only after approval by the Secretary of Defense:
5. that there is always available an up-to-date, approved five-year program for U.S. defense activities.[23]

The PCR system represents a general control mechanism outside

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[22]Hitch, "Decision-Making for Defense," op. cit., p. 29.

[23]William W. Kaufmann, The McNamara Strategy, (New York: Harper & Row, Publishers, 1964), p. 177.

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the annual budget review for decision making. It occupies a key position in program budgeting in the DOD, since only through it can additions, deletions or modifications to the approved five-year program be introduced by the services.

The submission of a PCR by a service usually comes as the culmination of a major study and must be accompanied by estimates of cost over the life cycle, and consider alternatives and tradeoffs. All proposals are submitted to the Office of the Assistant Secretary of Defense (Systems Analysis) for review and proposal of a response for the Secretary of Defense.

A Synthesis

"From a small beginning, systems analysis has now become a vital and integral part of the Defense Department decision-making process."[24]

In September, 1965, the position of Assistant Secretary of Defense (Systems Analysis) was established. Prior to this time analysis was a function of the Assistant Secretary of Defense (Comptroller). The creation of this office gave explicit recognition of the importance in which systems analysis is viewed by the Secretary of Defense. The responsibilities, functions, and authorities specified in the implementing directive or charter are: (1) review quantitative requirements, including

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[24]Hitch, "Decision-Making for Defense," op. cit., p. 56.

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forces, weapon systems, equipment, and personnel for the Secretary of Defense; (2) assist the Secretary in the initiation, monitoring, guiding, and reviewing of requirements and cost-effectiveness studies; (3) to encourage, throughout the Department of Defense, the use of the best analytical methods; and (4) to conduct special studies when directed by the Secretary. Authority was granted to communicate directly with all DOD components; to issue instructions and directives; and to obtain such information, advice, and assistance from DOD components as he deems necessary.[25]

Recognition of the vital role of systems analysis in the decision process has spawned an "in house" capability not only in the Office of the Secretary of Defense, but in the Joint Chiefs of Staff, the headquarters of the military departments, and at other management levels of the defense establishment. The Defense Department also supports a number of outside groups, as indicated earlier, including RAND for the Air Force, the Research and Analysis Corporation for the Army, the Center of Naval Analyses for the Navy and the Institute for Defense Analysis for OSD.

Systems analysis provides the analytical foundation for the decision process. The Program Change Request System centralizes, controls, and channels all requests for change to the Five-Year Plan and only the Secretary of Defense can approve a change to the Five-Year Plan. Thus,

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[25]U.S. Department of Defense, Charter for the Assistant Secretary of Defense (Systems Analysis), DOD Directive 5141.1, September 17, 1965, pp. 1-4.

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[1] U.S. Department of Defense, Directive 5141.1, September 1, 1965, pp. 1-4.

the Secretary of Defense now has all the tools he needs to take the initiative in the planning and direction of the intire defense effort.[26]

In summary then, the major considerations in program budgeting are:

(1) Structural or format aspects concerned with establishing a set of categories (a program and program element structure) oriented toward "end-product" or "end-objective" activities that are meaningful from a long range planning point of view; The Five-Year Force Structure and Financial Program.

(2) Analytical process considerations conducted as an integral part of the program-budgeting process and within the framework mentioned above to systematically examine alternative courses proposed by Program Change Requests in terms of utility (benefit) and cost to clarify the relevant choices.

(3) Information system considerations to support the first two items, principally: progress reporting and control, to give indication of how well (or poorly) major program decisions are being carried out; providing data and information to serve as a basis for the analytical process particularly to faciliate the making of estimates of benefits and costs of future alternative courses of action by means of a data bank of relevant information.[27]

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[26]Ibid., pp. 57 and 58.

[27]F. H. Fisher, The World of Program Budgeting, (Santa Monica, Calif.: The RAND Corporation, May 1966), pp. 7 and 8.

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[87]Ibid., pp. 87 and 92.

[88]E. B. Fisher, The World of Strategic Investments (Santa Monica, Calif.: The RAND Corporation, May 1970), pp. 1 and 2.

"People have tended to focus on the structural (format) and progress reporting aspects, to the relative neglect of the analytical part of the system. This, I think, is a great mistake. Many of the most important advantages of a program budgeting system cannot be realized without setting up a solid analytical activity to generate and specify alternative future courses of action."[28]

Systems analysis is not synonymous with PPB, but as currently practiced within the DOD, it constitutes one of the most important elements. It provides the menu of choice for defense decision making; it screens requests for change to the Five-Year Plan; and, through the Office of Systems Analysis, prepares answers to the service components for the Secretary of Defense on service requests. Its power to influence defense decisions is obvious; not so obvious is the power to delay decision by requirements for the conduct of additional study.

Hitch argues that.... "programming is possible, indeed has been used, without systems analysis, and can achieve some of its important objectives-- order, consistency, and rough intuitive balance among programs-- without it."[29] The nature of this proposition invites the conclusion that for truly effective programming, systems analysis is necessary to provide the requisite equation between means and ends-- "inputs" and "outputs"-- budget and programs.

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[28]Ibid.

[29]Hitch, "Decision-Making for Defense," op. cit., p. 72. (underlining supplied)

people have tended to focus on the structural (formal) and
processes (operating concepts) to the relative neglect of the analytical
part of the system. This, I think, is a great mistake. Many of the
most important systematic or process budgeting systems cannot be
realized without setting up a public analytical activity to generate and
specify alternative issues courses of action.

Systems analysis is not synonymous with PPBS, but was originally
developed within the DOD. It constitutes one of the most important
elements. It provides the means of choice for defense decision making;
it corresponds roughly in scope to the Civil-Wider Staff work through the
Office of Emergency Preparedness or to the analytic components
for the Secretary of Commerce or Interior. Its power to influence
defense decisions is considerable but is dependent in the power to deny
decision by requirements for the conduct of additional study.

Ellis argues that... "programming is possible, indeed has been
done, without systems analysis, and can maintain some of the important
objective-setting, consistency, and cross-cutting qualities even
programs without it."[28] This makes explicit the proposition involves the
conclusion that for truly effective programming, systems analysis is
necessary) to provide the requisite relation between systems and subsystems
"inputs" and "outputs"--output and processes.

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[28]Ellis, "Decision-Making for Defense," op. cit., p. 72.
(unverified footnote)

CHAPTER III

THE ESSENCE OF THE METHOD

"In the search for the truth of things method is indispensable" -- Descartes

An Overview

The Economics of Defense in the Nuclear Age, written to explain a way of looking at military problems, regards all military problems as economic problems in the efficient allocation and use of resources. It is concerned more with how to view military problems and how to go about solving them than with the substantive solutions themselves.[1] Three interrelated and interdependent approaches were considered: (1) the improvement of institutional arrangements within the government to promote efficiency, improve budgeting and accounting methods, provide more appropriate incentives, and reorganize the apparatus of decision making; (2) increase reliance on systematic quantitative analysis to determine the most efficient alternative allocations and methods; and (3) increase recognition and awareness that military decisions are economic decisions, and that unless the right questions are asked, the appropriate

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[1]Hitch and McKean, op. cit., p. v.

[illegible] and Hitch, op. cit., p. v.

alternatives related for comparison, and an economic criterion used for choosing the most efficient, military power and national security will suffer.[2]

In this economic approach to systems analysis, there is no unique method to be followed, but there are several stages which might be termed the "scientific method." In this context, the "scientific method," is concerned more with the adoption of a posture of objectivity and the raising of constructive criticism and alternatives than with the traditional viewpoint of pure science. Science does not rely on personalities, reputations or vested interests, but rather on explicit calculations, assumptions, data and judgments subject to verification, criticism, and duplication of results by others. The stages of the scientific method through which analysis must advance are: formulation; search; explanation; and interpretation.[3]

The formulation stage attempts to isolate the questions and issues involved and to define the meaning of the variables or factors which are sonsidered relevant to the situation and to state the relationships among these factors. This is the most important stage, for the time spent restating the problem in different ways, redefining it, or expressing its limits may indicate whether or not the matter under consideration is

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[2]Ibid., p. 107.

[3]E. S. Quade (ed.), Analysis for Military Decisions, (Santa Monica, Calif.: The RAND Corporation, November, 1964), p. 156.

alternatives related for comparison, and to economic criterion used for choosing the most efficient, military power and national security will suffer."[3]

In this economic approach to systems analysis, there is no unique method to be followed, but there are several steps which might be termed the "systematic method." In this context, the "client of the analyst," is normally cast into the adoption of a posture of objectivity and the trading of constructive criticism and alternatives than with the position of the client or user. Systems does not rely on personalities, reputations or rules of thumb, but rather on explicit calculations, assumptions, logic and judgment to clarify, criticize, and quantification of results by others. The study of the most useful method through which analysis of usual schemes are: formulation; research; explanation; and interpretation.[4]

The formulation step attempts to isolate the questions and issues involved and to define the meaning of the variables or factors which are considered relevant to the situation and to state the relationship among these factors. This is the most important step, for the time spent restating the problem in different ways, exploring it, or researching its limits can indicate whether or not the best or under consideration is

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[3] Ibid., p. 157.

[4] E. S. Quade (ed.), Analysis for Military Decisions, (Santa Monica, Calif.: The RAND Corporation, November, 1964), p. 186.

significant and point the way to its solution. An obvious point often overlooked is the critical examination of the original proposal. Since the concern is with the future, the major job may be to decide what the policymaker should want to do.

The search stage is concerned with finding the facts, or evidence, on which the analysis is based. It is necessary to look for ideas and evidence to support them, including the invention of new alternatives. Unless there are alternatives and ideas about them, there is nothing to analyze or to choose between. Hitch indicates that an analyst makes his greatest contribution by inventing new systems rather than by comparing proposed systems. As an example, he cites the analysis for rapid deployment of forces to trouble spots around the world. Early analysis concentrated on aircraft since sealift was regarded as too slow to be a competitor. From the outset, pre-positioning of men and equipment, or equipment only, was recognized as an alternative and included in the analysis. A serious problem of prepositioning is the difficulty of acquiring real estate for the purpose in foreign countries, and the likelihood that the prepositioned stocks will be in the wrong country if hostilities threaten or actually break out. Of secondary concern is the changing political climate throughout the world and the balance of payments difficulty. So the analyst posed the question: why not pre-position the ships? This creative alternative became the solution. From W.W. II

Victory ships loaded with Army equipment stationed in the Western Pacific, current budget requests include funds for a new class of ships, the Fast Deployment Logistics ship patterned after the Roll-on/Roll-off commercial carriers. The overall result is a more flexible, greatly expanded airlift, rapid-deployment capability.[4]

It is sometines true that in the gathering of facts the problem solution may be found. More often, however, all the facts are never known. In some cases, the total possible alternatives may be endless and it then becomes necessary to limit the alternatives to the most feasible in order to perform a meaningful study within the time and resource constraints. Judgment on selecting alternatives, fact gathering and knowing when to stop is a crucial and necessary concern. It is out of the question to collect all the information required for exhaustive analysis let alone process it.

The explanation stage attempts to order the facts and alternatives logically to facilitate examination of their implications. To make progress, a great many features of a question under study are ignored while certain aspects, hopefully, the relevant ones, together with their interactions are abstracted to make an idealized version of the real situation. This idealization is called a model. The difficulties of model building are many; but not knowing at the start what is superfluous and

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[4]Tucker, op. cit., pp. 128-129.

[illegible] [illegible] [illegible] [

what is relevant is perhaps primary. All the assumptions of the model must be made explicit in such a way that the responsible decision maker can make his judgment based on the full range of relevant assumptions.

The interpretation stage is a critical examination of the results obtained from the model. This solution must be interpreted in the light of considerations which may not have been adequately treated by the model, such as uncertainty and non-quantifiable factors. At this point the process becomes iterative; the sponsor or the real world attempts to counteract the solution of the analyst, since the solution may not be necessarily a good answer to the original problem due to oversimplification, drastic idealization, and aggregation caused by the mathematical format.[5]

In areas such as defense planning, where there is no accepted theoretical foundation, advice obtained from experts rises largely from judgment and intuition. Similarly, systems analysis depends on judgment and intuition, but combines the contributions of experts in many fields to yield results superior to any ordinary individual or committee. The essence of the method is to construct and operate within a model, which may be a computer simulation, a war game, or a purely verbal scenario. The purpose is to introduce a precise structure and terminology for the participants to exercise their judgment and intuition in a concrete

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[5]Quade, op. cit., pp. 156-176.

context, in proper relation to each other using a common media of communication. By utilization of feedback concepts, the problem becomes regenerative and the experts can revise earlier judgments and thus arrive at a clearer understanding of the problem and its context.

The significance of the model can be appreciated most by looking at its relation to the other elements of analysis. Within every analysis of choice, although not always explicitly identified, are five common characteristics:

1. The objective (or objectives). Systems analysis is undertaken primarily to choose a policy or course of action. The first and most important task of the analyst is to discover what the objectives of the decisionmaker are (or should be) and how to tell the extent to which they are, in fact, attained by various actions. This done, strategies, forces, or equipment are examined, compared, and recommended on the basis of how well and how cheaply they can accomplish these objectives.
2. The alternatives. The alternatives are the means by which it is hoped the objectives can be attained. They need not be obvious substitutes for one another of perform the same specific function. Thus shelters, "shooting" defenses, a counterforce capability, and retaliatory striking power are all alternatives in protecting civilians against air attack.
3. The costs. The choice of a particular alternative for accomplishing the objective implies that certain specific resources can no longer be used for other purposes. These are the costs. In analyses for a future time period, most costs can be measured in money, but their measure is in terms of the opportunities that they preclude. Thus, if we are comparing ways to suppress guerrillas, the damage to nonparticipants caused by the alternatives must be considered a cost, for such damage may recruit more guerrillas.
4. A model (or models). A model is a simplified, stylized representation of the real world which abstracts the cause-and-effect relationships essential to the question studied. The means of representation may range from a set of mathematical equations or a computer program to a purely verbal description of the situation, in which intuition alone is used to predict the consequences of

various choices. In systems analysis (or any analysis of choice), the role of the model (or models, for it may be inappropriate or absurd to attempt to incorporate all the aspects of a problem in a single formulation) is to estimate for each alternative the costs that would be incurred and the extent to which the objectives would be attained. This requires a measure of effectiveness or means for indicating the degree of achievement for each goal.
5. A criterion. A criterion is a rule or standard by which to rank the alternatives in order of desirability and to choose the most promising. It provides a means for weighing cost against effectiveness.[6]

Depending on the nature of the problem at hand, the model used in the analysis may be formal or informal, mathematical or only moderately so, and may or may not rely on use of computers. The point is that the model need not be highly formal or mathematical to be useful. It must be remembered that model building is an art, not a science, and is often experimental. The main purpose in designing the model is to develop a meaningful set of relationships among objectives and the relevant alternatives available for attaining the objectives by equating the estimated costs and benefits of the several alternatives.

Conceptual Considerations

The basic premise that military decisions are economic decisions recognizes that military wants are limited by the scarcity of resources, otherwise each service could have all of everything it desired and there would be no need to exercise choice. Since there are resource constraints, in general there are two principal conceptual approaches:

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[6]E. S. Quade, Military Analysis, (Santa Monica, Calif.: The RAND Corporation, November, 1965), pp. 7-8.

1. Fixed utility approach. For a specified level of utility to be attained in the accomplishment of some given objective, the analysis attempts to determine that alternative (or feasible combination of alternatives) likely to achieve the specified level of utility at the lowest economic cost.
2. Fixed budget approach. For a specified budget level to be used in the attainment of some given objective, the analysis attempts to determine that alternative (or feasible combination of alternatives) likely to produce the highest utility for the given budget level.[7]

The fixed level of utility or budget is usually specified by someone outside the analysis and it usually is a given datum to the analyst. Very often several levels may be used to investigate the sensitivity of the ranking of the alternatives to utility or budget level. The charge is sometimes made that the fixed budget approach violates the principal of calculating the size of defense programs on the basis of military need rather than as limited by a fixed budget. However, there is nothing in the fixed budget analysis approach which dictates the budget level as the final criteria of program size. Obviously the level of the budget selected for the analysis should provide a rational level of effectiveness. Otherwise the fixed costs of the program may distort the results. When the study is conducted at the level of some reasonably fixed budget, the end result will provide data on the marginal cost of adding increments of effectiveness. If necessary, the decision-maker can then make a reasonable adjustment in the final budget level to achieve the effectiveness desired. If a program is being analyzed in

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[7]G. H. Fisher, The World of Program Budgeting, (Santa Monica, Calif.: The RAND Corporation, May, 1966), pp. 14-15.

which the objectives and degree of effectiveness desired is quite clear, then this is of course a strong argument for holding this element fixed during analysis, but in principle either approach is acceptable.[8]

Uncertainties asssociated with systems analysis are usually divided into two categories: real and statistical. Each affects the outcome in the same sense mathematically, but the nature of each is quite different. "In the long run," Lord Keynes said, "we shall all be dead;" the point to be made is that we cannot afford to ignore uncertainty from our ignorance of the future.

Real uncertainty reflects the unknowns surrounding the state of the world in the future. This class of uncertainty consists of four major elements: (1) planning and cost factor uncertainty, (2) Strategic uncertainty, (3) technological uncertainty, and (4) uncertainty about the enemy and his reactions.[9]

Every model uses certain input relations known as "planning factors"-- for example, the average number of hours a cargo plane can be used in a day. In any particular analysis, it is never possible to calculate everything from scratch. As a consequence, planning factors are borrowed from other analyses of varying quality together with their biases. Invariably the factors are discrete values rather

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[8]Hitch and McKean, op. cit., pp. 166-168.

[9]Ibid., p. 188.

[illegible] the objectives and desires of [illegible] involved in such cases, [illegible] it of course a [illegible] for [illegible] [illegible] [illegible]

than a range or probability distribution. Average values are not necessarily wrong, but the uncertainty of the variation should be recognized. Cost estimating is an approximate art even in the best-run businesses. There are numerous examples of weapon systems where cost estimates were exceeded by factors of ten or modifications that doubled systems cost.[10]

Strategic uncertainty addresses the problem of the context in which the next war will take place. The timing of the war, its extent, the availability and participation of allies, the use of nuclear weapons, and the political power relationships between nations are but a few of the dubious, but necessary concerns of this imponderable.[11]

The technological revolution, wherein conservative estimates state that 95% of the known inventions were conceived within the last 100 years, shows every evidence of continuing. The controversial TFX, which will be treated in a later chapter, embodies revolutionary technology and is already three years behind schedule. Expert guesses about the dates of operational missile systems have varied as much as ten years.[12]

Perhaps the most perplexing uncertainty concerns the enemy and his reactions. A military tactic, strategy, force or development

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[10]Ibid., pp. 189-190.

[11]Ibid., pp. 189-190.

[12]Ibid., pp. 190-191.

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[10] Ibid., pp. 142-150.

[11] Ibid., pp. 116-23.

[12] Ibid., pp. 103-107.

program is never good-in-itself, but only good-in-relation-to the tactics, strategy, forces, and future weapon systems of an enemy. Intelligence about an enemy is always less than perfect as experience in Vietnam attests. The difficulty in predicting when an enemy will achieve a certain capability when we cannot predict our own success with infinitely more knowledge of our progress, is indicative of the difficulty. Of even greater concern and more fundamental than ignorance of enemy capability, is ignorance of enemy intent or strategy.[13]

Statistical uncertainty, the uncertainty resulting from the chance element in recurring events, persists even if enemy strategy and the central value of all important problem parameters were known. It is the uncertainty about which books on probability theory are written. Unfortunately, in most practical problems, the real uncertainties dominate the statistical uncertainties.[14]

Since most decision problems are concerned with future events and uncertainty, analysis of such problems must provide explicit treatment of uncertainty. Statistical uncertainty can be handled by Monte Carlo or other techniques to deal with these fluctuations; but these deviations are often dominated by real uncertainty in long-range planning problems. Dealing with statistical uncertainty in such problems is nothing more than expensive window dressing. Techniques most often used in

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[13]Ibid., p. 191.

[14]Ibid., pp. 191-192.

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[13]Ibid., p. 141.

[14]Ibid., pp. 141-142.

long-range planning where real uncertainty prevails are sensitivity, contingency, and a fortiori analysis.[15]

In sensitivity analysis, several values may be used (high, medium, and low), rather than one expected value in order to see how sensitive the alternative would be to variations in the uncertain parameter. In contingency analysis, an investigation is made to see how the relative ranking of alternatives holds up by assuming changes in the environment or evaluation criteria. (For example, if the enemy is assumed to be Red China and North Vietnam, what would happen if Cambodia and Laos joined the coalition.) In a fortiori analysis, if intuitive judgment favors one alternative, the analyst may handicap or deliberately favor another alternative. If the first alternative still looks good under adverse conditions, it makes a strong case for the first alternative.[16]

Problems subjected to analysis more often than not will be dynamic, or will have dynamic aspects to them. One alternative may be better today than another, but over time the opposite could be equally true. If the decision maker is not indifferent concerning time preference, then cost of the several alternatives have to be "discounted" at an appropriate rate which can be a problem in itself. In any event, time aspects further complicate the analysis if only by addition of another

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[15]Herman Kahn and Irwin Mann, Ten Common Pitfalls, (Santa Monica, Calif.: The RAND Corporation, July, 1957), p. 8.

[16]Fisher, op. cit., pp. 16-17.

long-range planning where real uncertainty prevails are sensitivity, contingency, and a fortiori analysis.[15]

In sensitivity analysis, several values may be used (high, medium and low), rather than the expected value in order to see how sensitive the alternative ranking is to variations in the uncertain parameters. In contingency analysis, an investigation is made to see how the relative ranking of alternatives holds up by assuming changes in the environment or evaluation criteria. (For example, if the enemy is believed to be Red China and North Vietnam, what would happen if Cambodia had also joined the coalition?) In a fortiori analysis, if intuitive judgment favors one alternative, the analyst may consciously or deliberately favor another alternative. If the first alternative still looks good under adverse conditions, it makes a strong case for the first alternative.[16]

Frequently subjects of analysis more often than not will be dynamic, or will have dynamic aspects to them. One alternative may be better today than another, but over time the opposite could be equally true. If the decision maker is not indifferent concerning time preference, then each of the several alternatives have to be "discounted" at an appropriate rate which can be a problem in itself. In any event, time aspects further complicate the analysis if only by addition of another

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[15]Herman Kahn and Irwin Mann, Ten Common Pitfalls (Santa Monica, Calif.: The RAND Corporation, July, 1957), p. 8.

[16]Fisher, op. cit., pp. 16-17.

variable.[17]

An often neglected, but necessary consideration involves checking the model to determine whether the analytical procedure used is a good representation of reality. This may well prove difficult, particularly in problems with time horizons five or more years into the future.

An integral part of the total analysis involves these qualitative considerations which could not be handled quantitatively in the model as well as those qualitative aspects which supplement the quantitative work. These subjective considerations must be made explicit to the decision-maker in the same manner as all other assumptions and simplifications made necessary in the construction of the model.

From the above description, attempts to apply a "scientific method" to problems of economic choice within a military concext can be extremelycomplex. The strengths and limitations of such a systematic analysis will be discussed subsequently, however the main points presented may be summarized as follows:

1. Since comparative analysis is the prime focus, it is vitally important to continually emphasize objectivity and consistency in the analytical concepts, methods, and techniques used.
2. Alternatives being considered and those created during analysis must be treated in an unbiased manner.
3. Analytical activity is an important and integral part of the total

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[17]Novick, op. cit., pp. 45-46.

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1 Jaworski, op. cit., pp. 43-44.

PPB process.

4. The primary purpose of analysis is not to make the decision, but to sharpen the intuition and judgment of the decision makers.

5. Proper structuring of the problem is all-important. The study must be addressed to the right questions.

6. Assumptions, uncertainty, and non-quantitative aspects of the problem must be made explicit so that the stylized model will not be confused with the real world it is attempting to simulate.

7. The model should be checked for validity of the analytical procedure and exercised to assure that it can describe known facts and situations reasonably well.

8. While cost-utility analysis stresses the quantitative methods, the analyst should supplement his quantitative work with appropriate qualitative analyses.[16]

Intangibles and Incommensurables

No matter how skillful the analysis, in problems of choice with great uncertainty, particularly military choice, there will be considerations of a subjective nature. Certain aspects of the problem or of the alternatives being compared cannot be quantified and translated into common values. If the value is money, items which cannot be evaluated in dollars by any objective and generally acceptable method are

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[16] Ibid., pp. 47-48.

[illegible] process.

4. The [illegible] [illegible] is not to [illegible] the decision,
[illegible] to control the decision and [illegible] to the decision maker.
[illegible] of these objectives of the process is [illegible]. The model
must be evaluated to see [illegible].

5. Sensitivity [illegible], the [illegible] sensitive aspects of the
problem must be [illegible] so that the decision maker will not
[illegible] the real value [illegible] is changed.

6. The model should be [illegible] for [illegible] of the [illegible]
procedure was [illegible] to ensure that it was [illegible]
more and [illegible] necessarily [illegible].

7. Since [illegible] analysis [illegible] to [illegible],
the [illegible] should [illegible] the [illegible] work with [illegible]
the qualitative analysis.[1]

Principles and Procedures

The author now applies the analysis, in procedure of choice with great uncertainty, particularly military choice, where all is [illegible] of a subjective nature. Certain aspects of the problem or of the alternatives being compared cannot be quantified and translated into common values. If the value is [illegible], those which cannot be evaluated in dollars or any objective and generally acceptable quantity are

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[1]Ibid., pp. 49-50.

incommensurables.[19]

Suppose that the preferred (minimum-cost) method of achieving the objective is expected to involve the loss of more lives than another alternative even after including the investment of time, money, and equipment of the additional men. For several reasons, we might be concerned about this. The higher casualties may adversely affect the morale of other forces in a manner not anticipated, although the casualties were explicitly considered during the analysis. The intangible character of a factor such as morale is almost impossible to evaluate. More importantly, the potential loss of human life poses a vexing problem. We are interested in saving lives for their own sake. Fewness of casualties is an objective in planning any military operation that is not fully compensated for by computations on the cost of replacements. One military solution may cost less materially but more in lives, but before we can rationally decide between such programs, in theory at least, a valuation must be placed on human life.

Many other examples of incommensurables are frequently encountered in military problems. In addition to the many factors which affect morale, we may encounter side-effects in building capability to fight one type of war when another type is the more likely; the political effects of decisions concerning actions such as the cancellation of Skybolt or the

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[19]Hitch and McKean, op. cit., p. 162.

[illegible]

[illegible] the [illegible] method of analysis, the objective is expected to involve the least of many [illegible] than another alternative even after including the [illegible] of [illegible], and acceptance of the additional area. [illegible] [illegible], one [illegible] concerned about this. The [illegible] usually some [illegible] about the morale of other farmers in a community not [illegible] because the [illegible] would [illegible] [illegible] the [illegible]. [illegible] is [illegible] character of a factor such as morale is obviously important to [illegible] more important, the [illegible] [illegible] of losses for [illegible] [illegible] problems. [illegible] [illegible] [illegible] [illegible] [illegible]. Farmers of [illegible] to be [illegible] [illegible] [illegible] [illegible] that is not fully [illegible] for a [illegible] [illegible] [illegible] [illegible] [illegible]. [illegible] military [illegible] [illegible] [illegible] [illegible]

reduction of NATO forces in Western Europe; the provocative effect of building a "thin" ABM defense shield; the calculated risk of intelligence gathering by U-2 flights or coastal surveillance by electronically equipped ships such as the Pueblo.

There are several ways to handle incommensurables in quantitative analysis. One way is simply to ignore them. More commonly, they are explicitly stated, then ignored. "Sometimes it is suggested that, if the analyst works hard enough, everything can be put in terms of a common unit."[20] As an example, court decisions awarding sums of money under insurance claims for loss of life or discounting to present value the anticipated future net earnings of an individual could be useful in particular problems, but none provide a generally valid and appropriate measure of "the" value of human life. Perhaps. more germane to the discussion is the fact that peacetime values are irrelevant in time of war or that court decisions are influenced by factors not inherent in the circumstances of the particular case--emotions of the jurors reflecting bias against insurance companies or rationalizing the ability of the insurance company to pay.

No one answer will suffice in the consideration of incommensurables and intangibles; they exist and must be explicitly displayed and made a part of the analysis so the decision maker is made aware of

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[20]Ibid., p. 134.

"Life", p. 114.

their existence. If they serve no other purpose, they may stimulate the analyst to invention of a more satisfactory alternative.

CHAPTER IV

AN APPRAISAL OF THE METHOD

"There is no good without ill in the world, but everything is mixed in due proportion." -- Euripides[1]

The Limitations and Weaknesses

General agreement exists that systems analysis or cost-effectiveness techniques are most useful when the objective or output is definitely fixed; that is, when there is only one dependent variable, and the sole task is to minimize costs which are readily and accurately measured. In such cases, alternative means to achieve the objective differ only in this key variable, and choosing the cheapest means in this sense is the only problem.

Alternatively, it is just as generally agreed that the approach is less useful in clarifying choices when the employment of different means leads to appreciably different results. Its usefulness is even more restricted, the more incommensurable the input factors and the more appreciable and unmeasurable the social, moral, and political costs other than those quantifiable in dollar terms. In other words, the usefulness of the technique is more limited, the less the problem is

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[1]Plutarch, "Morals on Contentedness," Section XV.

CHAPTER IV

AN APPRAISAL OF THE BASICS

"There is no good advice in the world, but everybody is going to the encyclopedia." -- Curtis[1]

The Limitations and Usefulness

General statements about [illegible] analysis or [illegible] are most useful when the objective or output is perfectly that is, when there is only one conceivable [illegible] task is to eliminate costs which are feasible and accurately measured. In such cases, alternative means to satisfy the objective differ only in this key variable, and choosing the cheapest means is the only problem.

Alternatively, it is just as important to see that the approach is less useful in clarifying choices when the [illegible] of different means leads to appreciably different results. The usefulness is often more restricted, the more inconsistencies the input factors and the more appreciable and unmeasurable the social, moral, and political costs other than those quantifiable in dollar terms. In other words, the usefulness of the technique is more limited the less the problem is

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[1]Eiteman, "Morals on Contributions," Section IV.

capable of uniform quantification. This limitation is quite obvious since rational decisionmaking is based upon the maximization of all benefits minus the value of all costs or disadvantages. Additionally, the usefulness of the method depends on the completeness with which the costs and benefits are analyzed.

Other than dollar costs are often crucial and easily lost sight of. Political costs can become dominant, as when the particular choice causes great inconvenience to an ally such as the cancellation of the Skybolt missile in December, 1962. This decision almost toppled the government of Prime Minister Macmillan, since the British had modified their bomber fleet in anticipation of this weapon. The costs of alternative missiles for the Vulcan bomber were equally prohibitive to the British. Finally, Britain was offered Polaris missiles for her nuclear submarines as a paliative in the Nassau Pact. Subsequently, President de Gaulle rejected the Nassau Pact and the Polaris missile offer and blackballed Britain from the European Economic Community.[2] It can be argued that these costs were explicitly considered when Skybolt was cancelled, but who could have predicted the final consequences?

Equally crucial are military decisions when choice engenders a sharp decline in morale. The controversial TFX multi-service fighter-bomber went through an unprecedented four rounds of competition

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[2]Kaufmann, op. cit., pp. 124-127.

capable of modern gentrification. This information is only a phone call
national decision-making to sweep upon the accumulation of all concepts
mutual the value of all cash or [illegible]. Traditionally, the condi-
dance of the medical defense or the [illegible] site which the cross
and [illegible] are analyses.

Many Euro dollar costs are [illegible] crucial and nearly [illegible].
Political costs can [illegible] Southeast, we note the particular circle-
cause great inconveniences to be [illegible] of [illegible] of the
Soviet allies in [illegible]. Cpc. This [illegible] almost topple the
[illegible] of Swiss [illegible] Association, more its Cyrus, and [illegible]
their honour fact in [illegible] of [illegible]. The cycle of [illegi-
tive] minister for the Yukon [illegible] very [illegible] economy in the
Syria. Finally, Britain was offered Paris [illegible] for [illegible]
subcommand as a politics in the Persian Post. [illegible], President
de Gaulle rejected the Persian Post and the Polaris [illegible] after an
[illegible] Britain from the European Economic Community. It [illegible]
be argued that these costs were explicitly considered when Britain was
cancelled, but who could have predicted the final consequences?

Equally crucial are military decisions when crisis [illegible] a
sharp decline in morale. The controversial ITX multi-service fighter-
bomber went through an [illegible] [illegible] of [illegible]

[illegible], op. cit., pp. 145-147.

between Boeing and General Dynamics by military evaluation teams. After each competition, the Boeing design was judged superior. "Then, to the chagrin of many, the surprise of some, and the cynical expectations of quite a few, McNamara .... overruled the military evaluators and announced that General Dynamics .... had won the competition."[3] The full ramifications of this decision may never be known; serious, perhaps irreparable, harm was done to the faith and confidence of service and contractor personnel in the selection process. There is small satisfication to be gained from a DOD directive establishing a Source Selection Evaluation Board two years after the TFX contract was awarded to General Dynamics over service protests.[4]

Problems for systems analysis are frequently important, urgent, and difficult. Consider the problem of determining a strategic force posture. It is not only important from a military viewpoint but equally from an economic one, since the cost of modern missile and aircraft systems dictate efficiency in their acquisition. It is urgent, for national security may rest on its solution. The many and diverse factors embracing the skills of engineering, economics, politics, psychology as well as military science are almost dwarfed by the conditions of uncertainty, the time and money to make them operational, and the

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[3]Tom Alexander, "McNamara's Expensive Economy Plane," Fortune, (June 1, 1967), p. 90.

[4]"Proposal Evaluation and Source Selection," DOD Directive 4105.62 (April 6, 1956).

will and intelligence of the enemy. The magnitude and complexity of the problem provides ample latitude for error on the part of the systems analyst.

The "attention bias" or party line has been described as "the most important single reason for the tremendous miscalculations that are made in foreseeing and preparing for technical advances or change in the strategic situation."[5] This weakness is insidious in nature and prone to exist in any organization. The party line can be most influential in shaping the early stages of a study. If the project sponsor poses a problem in certain ways or if widespread beliefs are held that he is adverse to certain approaches, then the range of alternatives may be limited from the outset. "Systems analysis groups working within the defense establishment tend to take on the philosophical coloration of their sponsoring organizations, if for no other reason than that they are exposed to the same environment and same influences."[6] What can happen is that, during the early cycles of a study, the analysts and successive reviewers become aware that some of the alternatives or certain assumptions being considered are frowned on by higher ranking officers. Appearing useless, even hazardous, to support unpopular views strongly, they are given less emphasis or forgotten entirely. After a period of successful work, a group of analysts

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[5]Kahn and Mann, op. cit., p. 42.

[6]Hitch, "Decision-Making for Defense," op. cit., p. 42.

Adams and Dixon, op. cit., p. 42.

Gibson, "Decision-Making for Children," op. cit., p. 42.

may become so entrenched in an organization that they lose their objectivity and independence of view.[7] The cliches, "maintain the status quo" -- "don't rock the boat" -- "discretion is the better part of valor," all apply.

Within the present DOD decisionmaking process itself, a growing apprehension that cost-effectiveness studies are a bias favoring those proposals so supported is quite obvious. The growth of the "think" industry and the number of universities and commercial concerns conducting systems analyses is impressive. Klaus Knorr and Oskar Morgenstern of the Center for International Affairs, Princeton University, questioned "...whether the recent emphasis on cost-effectiveness may not be too much of a good thing." They went on to say:

> Admittedly, sophisticated cost-effectiveness studies played too small a role until Mr. McNamara became Secretary of Defense. But there are fairly widespread feelings that its present role may be excessive and constitute an over-reaction to the previous lack.[8]

They agree that cost-effectiveness studies are valuable in comparing similar weapon systems, but they question their utility in choosing between dissimilar weapon systems since they may "act as too sharp a brake on the innovating process that is concerned with radically new ideas." The conservative bias favoring the old has been widely criticized.

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[7]E. S. Quade, Some Comments on Cost-Effectiveness, (Santa Monica, Calif.: The RAND Corporation, March, 1965), p. 6.

[8]Hitch, "Decision-Making for Defense," op. cit., p. 72.

"The relatively stable level of research and development spending over this period conceals a significant shift in emphasis, away from innovation and toward refinement of existing weapon systems. The U. S. has chosen not to maintain the initiative, while the U. S. S. R. has visibly bent every effort toward seizing it."[9]

Enthoven recognizes the problem of bias against the new, but feels that the method of open explicit analysis is superior to reliance on judgment and intuition or experience unsupported by analysis. In explanation, he asserts that:

> The reason for the bias is that we all tend to compare the old and the new in the current mission that happens to have been optimized for the old... The new system is charged with its initial investment as well as operating costs, while the old system is only charged with its operating cost. I... plead guilty to this accusation but insist that this is not an unfair bias. Rather, it is the correct precedure for a rational equipment replacement policy. The point is that our objective, in selecting the rate of replacement of weapons and ships, should not be to maximize the degree of newness in the forces. It should be to maximize the total effectiveness we get out of the resources available for defense.[10]

Charles Schultze, former Director of the Bureau of the Budget, testifying before the Jackson subcommittee in August, 1967, was questioned if it is desirable to systematize the generation of facts so carefully and within such carefully defined patterns and limits that a bias is introduced which precludes dissent, inquiry and perhaps controversy. In qualifying

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[9]Richard J. Whalen, "The Shifting Equation of Nuclear Defense," Fortune, (June 1, 1967), p. 86.

[10]Tucker, op. cit., pp. 181-182.

[illegible] of economy and operational specialty over [illegible] economic and to economic, every [illegible] and between refinement of existing weapon systems. The U. S. [illegible] not to constrain one military, while the U. S. S. R. may vigorously [illegible] effort toward obtaining it.[6]

Rationale precipitated [illegible] to [illegible] but [illegible] that the creation of open hostile [illegible] [illegible] [illegible] dismal and isolation or [illegible] incorporated by analysis. In explanation, [illegible] stated:

> The reason for the rules is just as old and to interpret the old and the new in the current climate that happens to have been [illegible] for the old... The new system is [illegible] its initial investment as well as operating costs, while the old system is only charged with its operating cost. [...] [illegible] quality to this assumption but insist that this is not so [illegible]. Rather, it is the correct procedure for a rational [illegible] investment [illegible]. The point is that our objective, in [illegible] the mix of [illegible] of weapons and [illegible], [illegible] not be to maximize the [illegible] of forces in the future. It should be to maximize the total effectiveness of [illegible] of the resources available for defense.[7]

Charles Schultze, former Director of the Bureau of the Budget, testifying before the Jackson subcommittee in August, 1967, was questioned if it is desirable to systematize the [illegible] of funds so carefully and within such carefully tailored patterns and limits that a bias is introduced which precludes [illegible] and [illegible] consideration. In [illegible]

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[6] Stephens J. Wilson, "The Shifting Equation of Nuclear Deterrence," Fortune, (June 1, 1967), p. 66.

[7] Enthoven, op. cit., pp. 181-182.

the question, Senator Jackson added that the decisionmaker may be told everything which went into the analysis but not what was left out. In reply, Schultze stated:

> I don't think that the answer to the problem of not having all of the right kind of facts or all of the right kind of analyses is "Let us scrap analysis, and let us scrap facts." I think I would worry a little more about the fact that at present the decisionmakers, however good they are, are making their decisions in the dark. As a general proposition of the Government, that problem is more of a difficulty than the fact that in building a systematic analysis, without having all the advocates in there, you may build some biases into it. While I won't deny this is a problem, it seems to me it is the lesser worry when you are disposing of $135 Billion worth of resources and making decisions affecting the security of a nation. I would much rather have a system which gives me an analysis, even though I have to be careful to make sure it isn't biased, than not to have an analysis at all ... As a general proposition, the problem of the President and Cabinet heads and the Congress is that they are usually presented with "yes" or "no" decisions, and not with alternatives.
>
> Now, your problem is the alternatives may themselves get biased. That may very well be. I can't say there won't be analyses that do bias the alternatives.[11]

From the foregoing, it would appear that the first step, and, perhaps, the most effective one, to eliminate bias is to recognize that it is likely to exist. Secondly, the analysis should be critiqued by people with a different viewpoint or set of cherished beliefs, preferably drawn from outside the organization.

Analysis is necessarily incomplete. Time and money costs place obvious limits on how far an inquiry can be pursued. The annual budget

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[11]Subcommittee of the Committee on Government Operations, Hearings, Planning-Programming-Budgeting 90th Cong., 1st Sess., August 23, 1967, Testimony presented by Charles L. Schultze, pp. 40-41.

Hearings, Planning-Programming-Budgeting, 91th Cong., 1st Sess., August 11, 1967, Testimony presented by Charles L. Schultze, pp. 40-41.

cycle invokes a natural cutoff and any Program Change Requests in process after August 1 are not processed as PCR's but are incorporated in the budget review process. Due to the number of PCR's submitted and the requirement for full justification including cost-effectiveness studies, the PCR system has not worked smoothly.[12]

Analysis can never treat all the considerations that may be relevant. Some are intangible such as Congressional reaction to decisions on base closings and decisions affecting the status of the National Guard. "Partly resulting from time pressure, cost-effectiveness studies are fragmentary, ... all costs and benefits do not receive due attention, and ... money costs claim undue emphasis. To put it more crudely, we may have too many cost studies and not enough cost-benefit studies; analyses overemphazing money costs ... just pretend to be cost-effectiveness studies."[13] The very fact that time moves on means that a correct choice at a given time may soon be outdated by events and that goals set down at the start may not be final. "Historically, by far the most important reason for poor cost estimates is that the system configuration changed substantially from the time the cost estimate was made to the

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[12]Novick, op. cit., pp. 65-66.

[13]Klaus Knorr, "On the Cost-Effectiveness Approach to Military R&D: A Critique" (Santa Monica, Calif.: The RAND Corporation, June, 1966), p. 4.

time the system became operational."[14]

One basic weakness in cost studies has been inadequate cost-of-ownership analyses and trade-off decisions. DOD has no data bank of such information and most cost-effectiveness studies today rely on assumptions. Yet ownership comprises approximately 35 percent of total life cycle costs.[15] Closely allied to this area of weakness is the use of cost estimates of one study to become an input to subsequent studies. Although the estimate may have been valid in its original application, it is frequently less so in later applications.

When great uncertainty exists to the most probable cost of a system, the service sponsor who is under pressure to "sell" his proposal, will take as his single estimated value the lower end of a range of possible values. This could be termed gamesmanship, but in the political arena, the sponsor must show his system to be better than other systems.[16] It may be convenient to forget how far predictions have missed the mark in the past. For example, estimates of the cost of production are seldom within a factor of 2 (200%) of actual cost, and not uncommonly, are off by factors of 5 to 10.

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[14]M. V. Jones, System Cost Analysis: A Management Tool for Decision Making," (Bedford, Massachusetts: The Mitre Corporation, November, 1965), p. 50.

[15]Paul V. Croke, (et al), "Lessons Learned from Contract Definition," (Boston, Massachusetts: Peat Marwick Management Systems Company, August, 1965), p. 11.

[16]Jones, op. cit., p. 157.

Similarly, slippages in time to operational status of from 2 to 5 years are not unusual. Performance parameters are generally more accurate, but even here differences of 25 percent from original estimates are not uncommon.[17] "In most long-range planning problems where major uncertainties are present, quantitative differences among alternatives must be at least a factor of two before we can even begin to have any confidence that the differences are significant."[18]

Measures of effectiveness are approximate. Usually the context in which analyses takes place is fairly broad, often very broad, and the environment very complex with numerous interactions among the key variables in the problem. This means that simple, straightforward solutions are the exception rather than the rule. Analysis cannot treat all relevant factors, it always leaves much to the judgment and intuition of the decision maker. At best, calculations by themselves give us, for each set of specific assumptions about the political and economic state of the world, the actions of the enemy or the outcome of various technological investigations, a somewhat less than objective appraisal of the effectiveness, for a fixed cost, of proposed forces or weapons attaining given goals.[19] "The analyst must clearly understand that any

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[17] Quade, "Analysis for Military Decisions," op. cit., p. 228.

[18] Fisher, op. cit., p. 25.

[19] E. S. Quade, Some Comments on Cost-Effectiveness, (Santa Monica, Calif.: The RAND Corporation, March, 1965), p. 5.

[illegible] objectives is their [illegible] nature of [illegible] is a [illegible] are not quantal. Intelligence techniques are [illegible] used [illegible] but even here effectiveness of [illegible] personal [illegible] from optimal estimates are not uncommon.[17] In more long-range [illegible] [illegible] [illegible]

effectiveness model ... abounds in uncertainties. As systems become more complex ... there is less chance for his models to be quantitative and more chance for his models to be based upon judgments."[20]

In the nuclear stalemate that this country is trying to achieve with Russia, deterrence is one of the prime objectives. Deterrence exists only in the mind of the enemy. To achieve this objective, we must not only have the weapons and the assured means for their delivery but we must convince the Russians that not only do we have the capability but that we are prepared to use it. Since we cannot read the mind of a potential enemy, how can we measure the effectiveness of the deterrent? Or perhaps equally challenging, will a point be reached, where our nuclear might is so weak or so strong that either case invites the potential enemy to take the calculated risk of a first strike? Quade postulates that the effectiveness of alternatives leading to deterrence cannot be measured directly. He indicates that if two systems were being compared and one could inflict 50 percent more casualties on the enemy than the other, we could not conclude that this means the system supplies 50 percent more deterrence. "In fact, in some circumstances, we find arguments that the system which threatens the greatest number of casualties may provide the least

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[20]H. S. Dordick, An Introduction to System Effectiveness, (Santa Monica, Calif.: The RAND Corporation, October, 1965), p. 7.

—H. C. Lefevre, La Introducción a Teoría Diferencial (Nueva
Livonia, Quill: The Rural Corporation, 1964), pág. 43.

deterrence![21] To create deterrence we must publicize the capability of our deterrence; how the enemy interprets this capability when we cannot do so ourselves is still another imponderable. "It is little wonder that cost analysts are unenthusiastic about imputations that rest on effectiveness measures. Yet these imputations do not introduce, but merely underscore, an analytic difficulty of effectiveness measures."[22]

No satisfactory way to predict the future exists. Since this is so, analysis must consider a range of possible futures or contingencies. A common failing in developing proposals for new forces or weapons is to concentrate technical competence and military expertise on a system that will be most effective in the environment expected to exist at some future time. The real problem is to provide a range of alternatives to confront a spectrum of future events. A quick look at past policies of massive retaliation and strategic bombing with a concomitant de-emphasis in tactical air and conventional ground forces proves the folly of one view of the future.

All analysis of choice falls short of scientific research. "It cannot be emphasized too strongly that a (if not the) distinguishing characteristic of systems analysis is that the objectives are either not

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[21] E. S. Quade, Cost Effectiveness: An Introduction and Overview, (Santa Monica, Calif.: The RAND Corporation, May, 1965), p. 11.

[22] Enke, op. cit., p. 51.

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[1] E. C. Quade, Cost Effectiveness: An Introduction and Overview, (Santa Monica, Calif.: The RAND Corporation, Nov. 1966), p. 11.

[2] Quade, op. cit., p. 31.

known or are subject to change."[23] Human judgment is exercised throughout the process of recommending courses of action. To design workable models of the problem many assumptions have to be made, a host of intangible considerations must be taken into account, and crucial variables may not be quantifiable; as a consequence, quantifiable aspects, particularly monetary costs, achieve a dominance. The practice of reporting very precise numbers connotes a psuedo accuracy because it implies a depth and precision of knowledge that in most cases simply does not exist. Quade summarizes that:

> "... an analysis may, on the surface, appear so scientific and quantitative that it may be assigned a validity not justified by the many subjective judgments involved. In other words, we may be so mesmerized by the beauty and precision of the numbers that we overlook the simplifications made to achieve this precision, neglect analysis of qualitative factors, and overemphasize the importance of idealized calculations to the decision process ... Even after noting these dangers and deficiencies, systems analysis may still look like a purely rational approach to decisionmaking, a coldly objective, scientific method free of the human attributes of preconceived ideas and partisan bias and judgment and intuition. Systems analysis may look like the scientific method applied to decisionmaking. It isn't.[24]

Some of the other weaknesses in this approach to decisionmaking are procedural fallacies. Very briefly these involve allowing top management to define the problem, set criterion, and impose unrealistic budget or utility parameters which unduly restrict the study. Failure to allow sufficient time for adequate study or undue use of computers

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[23] Wildavsky, op. cit., p. 299.

[24] Quade, "Some Comments on Cost-Effectiveness," pp. 12-13.

[illegible]

to optimize costs mechanically to achieve or create a criterion. Recognizing a bias in the system against the new, a tendency exists to refine or increase the investment in the proven system and to utilize previously successful studies to resubmit follow-on proposals. Since much of analysis is creative, restrictions which inhibit the range or depth of the study should be viewed as areas of potential weakness.

It is easy for the analyst to become more interested in the model than the problem itself. This is a human weakness of highly trained people in using their talents to the utmost, to focus attention on the mechanics of the computation or in the technical relationships of the model rather than on the important questions raised in the study. In this manner, they may discover a great deal about the inferences the model may provide, but very little about the question they set out to answer. Equally serious is the assumption that if the work of manipulating the model is done correctly, systems analysis is unlimited in the advice it can supply the decisionmaker.[25]

Enthoven cites a danger often criticized in the systems analysis approach -- confusing performance with effectiveness. He admits that a narrow edge in performance, such as the speed of an aircraft, can have a significant impact on effectiveness, also that this problem is

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[25]E. S. Quade, Some Problems Associated with Systems Analysis, (Santa Monica, Calif.: The RAND Corporation, June, 1966), pp. 18-19.

to optimize some hypothetically to accuracy or create a criterion. Necessarily a loss in the system objective, a tendency exists to refine or increase the investment in the proven system and to utilize previously successful models to research fallacious premises. Since much of analysis is complex, practitioners often tailor the scope of each of the study (should be viewed as areas of potential weakness).

It is easy for the analyst to become more interested in the model than the problem itself. This is a serious weakness of highly trained people in using their talents in the abstract. In addition to the complexities of the computation or by the technical preoccupation of the model rather than on the important questions related to the study. In this manner, they may discover a great deal about the behavior the model may provide, but very little about the questions they set out to answer. Equally serious is the assumption that if the work of sensitivity the model is done correctly, systems analysis is unlimited in the advice it can supply the decisionmaker.[3]

Enjoyed also a danger often criticized in the systems analysis approach -- confusing performance with effectiveness. To admit that a narrow gain in performance, such as the speed of an aircraft, can have a significant impact on effectiveness, also that this problem is

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[3] E. Quade, Some Problems Associated with Systems Analysis, (Santa Monica, Calif.: The RAND Corporation, June, 1966), pp. 11-12.

not confined to systems analysis alone.[26]

Last and of considerable import to the success of any analysis -- the results are limited by the capabilities of the people performing the study. The experience ... clearly indicates that a nominal inter-disciplinary approach is inadequate. The individual scientist, engineer, and technician must become an integrated team—interacting in a common environment on a day-to-day basis with a common problem-oriented focus ... The development of this capability is a hard-won, time-consuming and a costly process ... The language and conceptual barriers are both large and real."[27] It is a matter for conjecture, at what point the team, by working in a close environment, acquires its own bias and ceases to function as an objective problem-solving group.

The Benefits

In view of the many defects and limitations, serious questions are raised concerning the usefulness of systems analysis. Invariably, the criticism concerns specific applications, some of which will be explored in the next chapter. Beyond the criticism, a strong, growing expertise has developed both in the military and civilian components of

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[26]Alain C. Enthoven, "The Systems Analysis Approach," (Presentation prepared for the Special Subcommittee on the Utilization of Scientific Manpower, Senate Labor and Public Welfare Committee, 89th Congress, 2d Session, May 17, 1966), p. 5.

[27]Thomas C. Rowan, Systems Analysis: Problems, Progress, and Potential, (Santa Monica, Calif.: Systems Development Corporation, 6 October 1966), p. 3.

The Specific

In view of the many methods and techniques available for related concerning the usefulness of evidence analysis. However, the critical concern specific questions, some of which will be explored in the next chapter. Beyond the problems, a strong, precise procedure was developed both in the military and civilian communities of

DOD and the "think" community. Some of this growth has undoubtedly been a tactical necessity as Seligman points out, the services "have been actively developing systems-analysis capabilities of their own, so that, to caricature the situation only slightly, they will be able to slug it out with Enthoven's boys on more even terms."[28] However, even within the services, there is a growing recognition of the benefits of knowing the cost and impact of various decisions on future capability and flexibility.

Between pure intuition and hunch on one hand and cost-effectiveness analysis on the other, there are sources of advice that can be employed to assist a decisionmaker. One alternative is the expert, but a truly unbiased one may be hard to find; another is the use of committees. Jokes abound on committees but they do perform a vital function in many areas. However, committees usually reach a finding by bargaining and the explicit reasoning employed is lost in the process so that a solution is structured with one point of view.[29]

In systems analysis, through the framework of the model, a large number of experts can focus on a problem and its alternative solutions. Instead of one solution or recommendation, they can present the decisionmaker with a range of possibilities explaining the relative

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[28] Seligman, op. cit., p. 119.

[29] Quade, "Cost-Effectiveness Analysis: An Appreciation," op. cit., p. 4.

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costs and benefits of each. By disclosing the method, assumptions, uncertainties and risks, the decisionmaker has a better understanding of the total problem. In this manner analysis may sharpen the intuition and broaden the basis for judgment of the decisionmaker.

Systems analysis falls short of being scientific research because its predictions ordinarily cannot be verified and the urgency of military problems forces the substitution of intuition and assumption for verifiable knowledge. "But in contrast, to other aids to decisionmaking, it extracts everything possible from scientific methods, and its virtues are the virtues of those methods."[30] Furthermore, knowledge of the limitations of systems analysis is shared by the experts, committees and others involved.

One of the most significant benefits of cost-effectiveness studies is the possible break through or invention of a new alternative that satisfies the objectives in a manner judged superior to the original proposals. The increase in airlift capability by the concept of pre-positioned cargoes in ships strategically positioned throughout the world, is a prime example.

The most significant benefit may well be that systems analysis does not accept the given objectives, but asks "what ought to be done — not simply how to do it."[31]

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[30] Quade, "Some Comments on Cost-Effectiveness, op. cit., p. 14.

[31] Quade, "Analysis for Military Decisions," op. cit., p. 7.

costs and benefits of each. By sketching the choices, assumptions, uncertainties and risks, the analyst-economist can a define unacceptable of the total problem. In this manner analysis may sharpen the issues and broaden the basis for judgment of the decision-maker.

Systems analysis will never be fully scientific because the predictions necessarily depend in varying and the degree of military problems forces the substitution of intuition and assumptions as verifiable knowledge. But in contrast to other fields in decision-making, it evaluate everything possible from economic science, and in virtue are the virtues of those sciences. To illustrate, some of the limitations of systems analysis is shown by the experts, consultants and others employed.

One of the most significant results of cost-effectiveness studies is the possible stress capacity or invention of a new alternative that satisfies the objectives in a manner far superior to the original proposal. This increase in utility by the concept of pre-positioned weapons in ships strategically positioned throughout the world, is a prime example.

The most significant benefit may well be that systems analysis does not accept the given objectives, but asks "what ought to be done — not simply how to do it."[1]

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[1] Quade, "Some Comments on Cost-Effectiveness," op. cit., p. 14.

[2] Quade, "Analysis for Military Decisions," op. cit., p. 9.

CHAPTER V

SYSTEMS ANALYSIS AND THE CONGRESS

" ... great ideas have a way of degenerating into petty techniques. " -- Charles Peguy

The Concerns

Prior to the arrival of Robert S. McNamara as Secretary of Defense, the alliance of the military and the Congress was a traditional feature of the Washington scene. When the military had been rebuffed by their civilian superiors, they turned to Congress, who with statutory responsibility for raising and maintaining the armed forces, together with the power of the purse to influence the size and disposition of such forces, often reshaped Defense decisions. Additionally, with the mandate to hold investigations and with access to subordinate as well as senior officials of the Department of Defense, Congress could inquire behind the scenes for motivating strategies. It is eminently clear, however, that the role of the Congress in determining national policy and defense policy, in particular, has deteriorated since 1961. The tools and techniques installed within the Pentagon to gain mastery over the military, indirectly provided the means to master the Congress

in almost as complete a fashion.

To summarize, the tools which comprise the basic system are: (1) the Defense Reorganization Act of 1958 which gave the Secretary of Defense the authority to go with the responsibility for running his department, (2) aligning the armed forces by mission under PPB from the traditional division of land, sea, and air or Army, Navy, and Air Force and (3) rationalized defense planning of missions and forces supported by cost-effectiveness studies to provide the basis for decision-making. Each of these tools has tended to remove the power of decision from the Joint Chiefs of Staff and the Service Secretaries and concentrate it in the hands of the Secretary of Defense assisted by the Office of Systems Analysis through which all requests for change are costed out.

PPB worked remarkedly well in three different respects:

> It ... provided the Secretary with a much clearer and more meaningful representation of the department's vital functions than was ever previously available, and it ... enabled him to relate and compare competitive and complementary activities much more readily than by examination of separate Service budgets drawn up according to the traditional accounts. The system also gave a sense of order and perspective to the annual budgetary cycle with its emphasis on a five-year plan and change proposals. Above all, it provided a common format and language for the Services and obliged them to think in terms of major missions of interest to the department as a whole rather than simply of their own separate functions.[1]

Prior to PPB, Congress, specifically the House Appropriations

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[1]Kaufmann, op. cit., pp. 290-291.

is almost as complex a task.

To summarize, the three principal basic options are (1) the Defense Reorganization Act of 1958 gave the Secretary of Defense the authority to do all the reorganizing he thinks necessary, (2) abandon the present scheme by creating three separate departments, or (3) abandon the present scheme by creating four separate departments (Army, Navy, Air Force and [a] coordinating agency [Secretary of Defense and Joint Chiefs of Staff] supported by some OSD elements should be created to provide the needs for coordination. Each of these three basic options would require the advice of Congress before it could be implemented. Each of these options would require the advice of Congress before it could be implemented. Each of these options would require the advice of Congress before it could be implemented.

[illegible] Congress, especially the House Appropriations

[illegible], op. cit., pp. [illegible].

Committee and the House and Senate Armed Services Committees, largely determined the Defense budget from testimony given by the services and, in a manner of speaking, played one service against the other. The hearings provided the members of Congress a means of developing judgments on which to base legislation; and they offered, in one form or another, an accounting to the American people of the policies and programs that guide the armed forces. The average Congressman who was not a member of one of the important committees could not possibly cast an intelligent vote on a measure as complicated as the Defense budget. Because of the admitted shortcomings of this system, Congress on several occasions recommended change. "In two letters to the Secretary of Defense in 1959, Representative George Mahon, (D. Tex.) then Chairman of the House Defense Appropriations Subcommittee, stressed the importance of looking at the Defense programs and budget in terms of military missions by grouping programs and their cost by mission. He also called for more useful information and for a practical means of relating costs to missions."[2] Superficially, at least, it would appear that with the arrival of McNamara and PPB, Congress now had the comprehensive Defense budget so long advocated.

As the defense program unfolded with McNamara exercising central control over the Department, commanding an enormous fund

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[2]Hitch, "Decision-Making in the Department of Defense," op. cit., p. 207.

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p. 17.

of knowledge, and presenting a carefully integrated budget, Congressional uneasiness and concern gradually mounted. Part of the uneasiness could be traced to the past nature of the relationship between Congress and the Department of Defense wherein divisions and rivalries within the Department allowed the Congress to play one Service against the other. With the advent of the new budgeting approach, the area for Congressional maneuver and bargaining declined, although relations with the Services remained close. It would be a mistake to trace Congressional uneasiness solely to this apparent decline in influence. The emerging policies of the new Secretary of Defense began to create genuine concern on substantive issues. "Many members of the Congressional committees were veterans of the postwar hearings and conflicts over defense programs. They were highly knowledgeable and they had played an important role in assuring the adoption of some of the key weapon systems in the American arsenal. Congressional pressure had had much to do with the decision to develop thermonuclear weapons, to push ahead with the Polaris program under forced draft, and to remedy deficiencies in the strategic nuclear posture in the wake of the first Soviet sputnik. The record testified that senators and representatives had every right to expect a respectful hearing for their views."[3]

Although Congressional concerns were addressed principally to

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[3]Kaufmann, op. cit., p. 207.

Although Congressional concerns were addressed principally to

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[illegible], op. cit., p. 101.

specific issues, they could logically be grouped into three major categories:

1. the relationships between the civilians and the military and the relative influence of the two groups in the resolution of major defense issues.

2. the kind of weapon systems that the United States should be developing, both nuclear and conventional.

3. the role of nuclear weapons in American defense strategy and policy.

In the summer of 1961, members of the House and Senate became concerned on learning that statements prepared by military officers for presentation to the committees of Congress in executive session had been subject to review and clearance by censors. This review included censorship by both the Departments of Defense and State. Although the Congress, after holding hearings on censorship of public speeches by top military officers, generally agreed with the policy principles, they regarded censorship of testimony before Congressional committees as highly objectionable. The Senate Armed Services Committee stated that this was an "improper practice and can only be calculated to obstruct unduly the free flow of information to which the Congress is entitled."[4]

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[4]Report of the Special Preparedness Subcommittee of the Senate Armed Services Committee (Military Cold War Education and Speech Review Policies), 87th Congress, 2nd Session, 1962, p. 18.

specific leaves they could be assigned duty there during
emergencies.

5. The responsible officers of activated and inactive units
of the military establishments of the United States in the
Washington area;

6. The Chief of Police of the District of Columbia and
responsible police officers;

7. The Chief of Police of the United States Capitol Police
Force.

It was the opinion of this Committee that the Chief of Police
of the District of Columbia should be invited to participate in
the discussions of the Committee regarding the plans for
handling the civil disturbances. This Committee was told that
the Chief of Police had declined to participate. This decision
was reported to the Secretary of the Army. This decision was
apparently by order of the Department of Justice and, although the
Committee felt that members of the Metropolitan Police Force
would be extremely helpful in handling the police problems, it
was without authority to insist upon the Chief of Police
participating. The Committee did, however, invite the Chief of
Police to send a representative to the meetings of the Committee
and this invitation was accepted.

[illegible] of the Special Preparedness Subcommittee of the Senate
Armed Services Committee (Military Role in Civil Disturbances and Domestic
Emergencies), 90th Congress, 2nd Session, 1968, p. [illegible].

It was accepted that military officers testifying before committees of Congress had the obligation to state the official Defense Department policy on the issue under consideration. However, there was a strong belief in Congress that these military officers should also be free, after setting out the Department position, to give their own personal opinions as long as they identified them as such. If high-ranking officers were not free to do this, Congress would be restricted to hearing one-sided presentations reflecting the views of the Secretary of Defense. Congress almost uniformly believed that "arbitrary and unjustified restriction upon the free flow of information to the Congress can only have the effect of hampering the legislative branch of the Government in the discharge of its constitutional duties and functions."[5]

The referenced hearings were held to investigate censorship of speeches by high-ranking military officers. However, the censors who had accomplished the actual editing were barred from testifying by order of President Kennedy. In a letter dated February 8, 1962, McNamara was authorized to use the controversial claim of "executive privilege." The letter read in part:

> I have concluded it would be contrary to the public interest to make available any information which would enable the subcommittee to identify and hold accountable any individual with respect to any particular speech that he has reviewed. I therefore direct you and all personnel under jurisdiction of your department, not to give any testimony or produce any document which would disclose such information; I am issuing parallel

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[5]Report of the Special Preparedness Subcommittee of the Senate Armed Services Committee (Military Cold War Education and Speech Review Policies), 87th Congress, 2nd Session, 1962, p. 19.

It was accepted that military officers implicated before congressional committees in the violation of civil liberties should not be tried, after retiring from the service, by military tribunals. However, there was a strong belief in Congress that these military officers should also be tried, after retiring from the Department positions, by duly their own personal opinions as long as they disturbed their work. A high-ranking military officer was not free, Congress would be restricted in enjoying non-civil privileges reflecting the views of the Secretary of Defense. Congressional circles maintained that retirement and subsequent restriction upon the free flow of information to the Congress can only have the effect of hampering the loyalties brought to the Government in the discharge of the constitutional duties and functions.

The enforcement measures were held to jeopardize democracy if executed by ill-reasoning military officers. However, the measures who has accomplished the actual mission was entered from hostility by waiver of Presidential Immunity. In a letter under February 6, 1958, Eisenhower was authorized to see the controversial claim of executive privilege. The letter read in part:

> I have considered it would be contrary to the public interest to make available any information which would reveal the conversations to identify and not necessarily any individual with regard to any particular speech that he may reviewed. I therefore have directed you and all personnel under jurisdiction of the Department, not to give any testimony or produce any document which would reveal such information [illegible]

Report of the Special Preparedness Subcommittee of the Senate Armed Services Committee (Military Cold War Education and Speech Review Policies), 87th Congress, 2nd Session, 1962, p. 12.

instructions to the Secretary of State.

> The principle which is at stake here cannot be automatically applied to every request for information. Each case must be judged on its own merits. But I do not intend to permit subordinate officials of our career services to bear the brunt of Congressional inquiry into policies which are the responsibilities of their superiors.[6]

In presenting the above letter, McNamara advised the subcommittee that he was responsible for running his department, and that he would make any explanations he thought necessary. Further, he advised that the committee could not go behind his statements in exploring why deletions were made.[7] Chairman John Stennis (D. Miss.) permitted the claim of "executive privilege" to stand, and members of the subcommittee failed to appeal the decision.[8]

While the Democrat-controlled subcommittee expressed grave concern over what it considered a direct curb on the information Congress could receive from military officers, it permitted the establishment of a precedent for total arbitrary secrecy to be established under the claim of "executive privilege." The subcommittee report recognized ... "it is not inconceivable that direct and specific questions on matters of vital importance may be overlooked if the military witness is not free to give his opinion without direct interrogation. Members

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[6]Ibid., pp. 508-509.

[7]Ibid., p. 30.

[8]Ibid.

> instructions to the Secretary of State.
>
> The principle which is at stake here cannot be automatically applied to every request for information. Each case must be judged on its own merits. But I do not intend to permit subordinate officials of our career services to bear the brunt of Congressional inquiry into policies which are the responsibilities of their superiors.[6]

In presenting the above letter, [illegible] [illegible] the [illegible] that he was responsible for [illegible] his department, and that he would take any [illegible] [illegible]. Further, [illegible] that the committee could not go behind the [illegible] to [illegible] [illegible] decisions were made.[7] Chairman John Stennis (D., Miss.) [illegible] the claim of 'executive privilege' to [illegible] [illegible] [illegible] to the [illegible] [illegible] failed to appeal the [illegible].[8]

While the Democratic-controlled subcommittee expressed great concern over what it considered a direct [illegible] on the information Congress could receive from military officers, it permitted the [illegible] of a precedent for that [illegible] [illegible] to be [illegible] under the claim of "executive privilege." The subcommittee report [illegible] . . . "It is not unreasonable that direct and specific questions on matters of vital importance may go unanswered if the military witness is not free to give his opinion without direct interruption. Members

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[6] Ibid., pp. 508-509.

[7] Ibid., p. 70.

[8] Ibid.

of Congress cannot be expected to know every detailed aspect of all matters presented to them. Therefore, without a full and free presentation by the knowledgeable military people, the Congress cannot obtain the full benefit of their specialized and expert views and thoughts. It is unthinkable that in our deliberations we should be restricted to the views and opinions of the Secretary of Defense."[9]

While a McNamara directive helped create the events culminating in the hearings, he managed to emerge stronger than before, with bolstered confidence in his ability to handle criticism in the Pentagon and in Congress.

Hanson W. Baldwin, military writer for The New York Times, wrote a scathing attack on "McNamara's Monarchy;" in focusing attention on the TFX award prior to hearings before the Senate Permanent Subcommittee on Investigations, Baldwin stated:

> "Objections or dissent, even to Congress, are discouraged, muted or, when possible, stifled. Mr. McNamara has pressured the Joint Chiefs of Staff to sign written statements testifying to Congress that the Administration's defense budget is adequate. He has censored, deleted and altered statements to Congress by the chiefs of the services and their secretaries. He has downgraded, ignored, bypassed or overruled the advice of the Joint Chidfs of Staff." He continued that, although McNamara had not forced the military services to speak with one voice, "he has come closer to it than anyone before him."[10]

The consequence of Congressional and military confrontations

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[9]Ibid., pp. 18-19.

[10]Baldwin, op. cit., p. 8.

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[9]Ibid., pp. 12-13.

[10]Galloway, op. cit., p. 1.

with McNamara left participants with mixed feelings of anger, frustration, confusion and admiration. The ability of McNamara for intelligent, incisive and sometimes profoundly simple logic or "his habit of marshalling a dazzling array of statistics to support his case in Congressional testimony has dismayed and irritated the Southern conservatives on the Armed Services Committees."[11] This irritation is all the more justified "when the Congressmen later discover they have been hoodwinked by McNamara's tactic of supporting a weak argument with an adroit combination of statistics and sophistry."[12] "His remarkable mental equipment served as sword and buckler ... in his scraps with Congress, which became increasingly bitter as the years passed. To bury criticism under a flood of facts is an old technique, but no one mastered it better than McNamara."[13]

At a time when the steady accrual of power by the executive branch has become a concern to many, McNamara helped accelerate this trend by providing the management tools the executive needed to manipulate what power it had and to acquire more.[14]

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[11]Neil Sheehan, "You Don't Know Where Johnson Ends and McNamara Begins," The New York Times Magazine, October 22, 1967, p. 131.

[12]Ibid., p. 132.

[13]Stuart Alsop, "After 7 Years, A Farewell to McNamara," The Washington Post, March 3, 1968, p. B2.

[14]Sheehan, op. cit., p. 128.

Although McNamara spoke out on a number of occasions to defend the right of dissent over Vietnam, within the Defense Department itself he practiced something akin to the democratic centralism of Lenin. He permitted free discussion only while a decision was in the process of being made. However, he would become acutely irritated if the pros and cons of discussion became a matter of public knowledge and debate through the press. Once a decision had been made he would tolerate no dissent. Pentagon officials became more frightened of frank discussion with journalists and outsiders than the officials of any other executive department in Washington.[15]

Sheehan, describing McNamara, notes:

> He studies a problem with such care and listens to so many opinions before making up his mind that when he does reach a decision he apparently develops an unshakable faith in its correctness. Thus, when McNamara makes a mistake, he is prone to make a big one and to defend it relentlessly in the face of criticism.[16]

During the hearings on PPB in August 1967, Senator Jackson expressing concern over the greater centralization of the decision process stated that, whether intended or not, voices of dissent at lower levels have considerable difficulty getting themselves listened to, on many critical issues, at high DOD levels. He also cited the danger that officials are tempted to embrace quantitative studies as

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[15]Ibid., pp. 128-129

[16]Ibid., p. 130.

Although legislatures rarely get on a statute of repudiation to defend the right of dissent over Vietnam, while the Defense Department itself is preoccupied recognizing with the Nuremberg obligations of Lawful. The Pentagon free discussion only serve a solution away in any process of being made. However, no valid decision merely invigilate if the true and core of dissension because a matter of public knowledge and debate through the press. Once a decision had been made by duly delegate no dissent. Fundamental principle should be practiced of these decisions with journalists and politicians from the efficacy of any other executive department in Washington.[1]

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[1] Ibid., pp. 136-139.

[2] Ibid., p. 130.

the final word and not ask the necessary mean, hard questions required to make sound decisions.[17] "People can really be snowed by the figures, and the elaborate statistics on costs and gains — which have been weighted on the basis of the assumptions and premises of the systems analysts. Unknown, unquantifiable, contingent factors can then vitiate these premises and assumptions and completely change what the decision should have been ... The fellow who controls the system can manipulate it and almost rig it."[18] "The bargaining in the Pentagon is weighted in favor of CSD and its analysts. Not all the participants in the adversary-process are on a parity."[19]

Other concerns raised by Congress included the transfer of decisionmaking in terms of weapon systems and defense functions from the Joint Chiefs and their associates to the civilian component in the Defense Department. The skepticism was addredded to civilian-trained people questioning dollar costs as paramount while military personnel are debating for the right to have the kind of weapon system they consider important ...[20] The Senate in an attempt for equality with the Executive Branch passed S.355, The Legislative Reorganization Act

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[17]Hearings, Planning-Programming-Budgeting, August 23, 1967, op. cit., p. 32.

[18]Ibid., p. 41.

[19]Ibid., p. 42.

[20]Ibid., pp. 44-45.

like flood waters and all the resources would have another problem to make sound decisions. [illegible] Should one worry or not [illegible] Supreme Court to determine whether or not [illegible] water have implied on its rights of the [illegible] and [illegible] problem analysis. [illegible] [illegible] [illegible] while there [illegible] and already have [illegible] [illegible] [illegible] regulation should have been. ... The [illegible] [illegible] [illegible]

of 1967. The House has never acted on this bill which would establish, among other provisions, "a PPB equivalent for the Legislative Branch, stocked with or programmed for the same information as the Executive system; and, second, it would require a system of interrogation with potential for varying response to give ... the basis for making a judgment in passing upon the recommendations of the Executive."[21]

The fears of Congress, expressed principally during hearings on specific issues, reflected the growing centralization of decisionmaking power in the Executive Branch, the downgrading of military experience and judgment, and the inability of the Congress to look behind issues due to censorship and the security classification of information considered necessary to the understanding of key decisions.

The TFX Controversy

Congressional hearings on the experimental tactical fighter known as the TFX began on February 26, 1963 amid charges of favoritism and conflict of interest. It should be noted that neither of these charges could be supported, but circumstances leading up to contract award and subsequent events resulted in heated controversy between DOD military and civilian elements and the Congress, which continues today.

The TFX had its origin in the late fifties, a time when military planners were preoccupied with rocket-launched nuclear warfare and a

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[21] Ibid., pp. 45-46.

[illegible]. pp. 15-16.

widespread feeling prevailed that manned combat aircraft had a questionable future. Both the Air Force and Navy were independently planning for replacement of the current generation of fighter aircraft. The Air Force, anticipating the replacement of the F-105 and F-100, focused attention on a technological break through — a "variable geometry" wing that could be swung forward for short takeoff capability and swept backward for supersonic flight. The Air Force design provided for a heavy fighter-bomber that could take off from 3,000-foot unpaved runways and fly for long distances at fuel-saving high altitudes. On entry over enemy territory, it would be able to plunge down to within a few hundred feet of the ground and make a 400-mile supersonic dash under defensive radar screens to deliver nuclear bombs. No other plane could then, or can now, fly supersonically any substantial distance at very low altitudes.[22]

The Navy needed a "combat air patrol" to counter a defensive weakness against enemy bomb or missile carrying aircraft. In addition to being able to take off from aircraft carriers, the Navy wanted a plane with ability to "loiter" at high altitudes, 150 miles from the fleet, detect enemy aircraft by radar and launch sophisticated computer-guided missiles to destroy them.[23]

Shortly after taking office in 1961, a comprehensive analysis of

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[22]Alexander, op. cit., p. 89.

[23]Ibid.

[illegible] serviced [illegible] aircraft [illegible] a [illegible]-
able [illegible]. [illegible] [illegible] were [illegible]
[illegible] replacement of [illegible] [illegible]. [illegible]
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attention to a [illegible] [illegible] [illegible] [illegible]
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[illegible] [illegible] [illegible] [illegible] [illegible]
navy [illegible] [illegible] [illegible] [illegible] [illegible]
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the production programs for the Navy F4H and Air Force F-105 convinced McNamara that one aircraft, the F4H, could meet the need for the Air Force as well as the Navy, and do it better than the F-105.

> The advantages of one weapon system over two are obvious. They result in substantial savings not only in the development, test and production stages, but throughout the life of the system in terms of logistic support, maintenance, training programs and operations.[24]
>
> Accordingly, further procurement of the F-105 has been terminated and the F4H, now designated the F-4, will be bought for both the Air Force and the Navy.[25]

With the experience of the F-4 in mind, McNamara directed the Navy and the Air Force to combine efforts, with the Air Force as project manager, to design a single fighter plane to meet proposed requirements. He was convinced that at least $1 billion in development, production, maintenance and operating costs could be saved; further that a plane of genuine tactical utility to both services could be delivered within the projected time frame.[26] The Air Force need for long range and the low altitude supersonic dash dictated a large heavy configuration due to fuel requirements; the Navy objected, claiming an aircraft of such weight could not fly off its carriers and would provide no capability

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[24]Hearings, TFX Contract Investigation, Permanent Subcommittee on Investigations, Senate Committee on Government Operations, 88th Congress, 1st Sess., March, 1963, Part 2, p. 376.

[25]Robert S. McNamara, Testimony before the Subcommittee of Defense Procurement of the Joint Economic Committee of Congress, March 28, 1963.

[26]TFX Contract Investigation, Part 2, pp. 376-377.

the procedure processes for the Navy F-4J and Air Force F-4J(S) configurations [illegible] the F-4B, would exist for the Air Force as well as the Navy, and so it [illegible] F-4J(S).

The acceptance of one weapon system over the [illegible] Navy reject in unresolved service - not only in its development, but also production stages, but throughout its life of the system in terms of logistic support, maintenance, training procedures and operations.[1]

Concurrently, further procurement of the F-4J(S) was [illegible] terminated and the F-4B, a more reliable [illegible] F-4J, will be [illegible] for both the Air Force and the Navy.

With the cancellation of the F-4 in mind, Secretary Clifford [illegible] Navy and the Air Force to consider whether, when the Air Force is [illegible] deployed overseas, it should purchase a single fighter to meet [illegible] requirements. He was convinced that at least [illegible] in development, procurement and operation could [illegible] a plan of general tactical utility [illegible] while the projected time [illegible] and the low altitude requirements [illegible] due to fuel requirements. The Navy opposed, claiming an aircraft [illegible] such weight could not fly off its carriers and would require [illegible]

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[1]Hearings, FY69 Control Investigation, Department Recommendations on Investigations, Senate Committee on Department Operations, also Congress, 1st Sess., Hearing, 1969, Part II, p. 710.

[2]Robert C. McNamara, Statement before the Subcommittee of Defense Procurement of the Joint Economic Committee of Congress, March 19, 1969.

[3]FY69 Control Investigation, Part II, pp. 516-517.

for addition of later developed weapons. McNamara insisted on a high degree on "commonality" of parts in the two versions of the aircraft to be built. The difference in needs of the two services coupled with the commonality dictum set the stage for the controversy which continues today.

Early in 1962, the rivalry for the TFX narrowed down to two major firms. The Boeing Company of Seattle, Washington, planned to build the plane at its plant in Witchita, Kansas, The General Dynamics Corporation of Fort Worth, Texas, cooperating with Grumman Engineering Company of Bethpage, New York, planned to build the Air Force version in Texas and the Navy version in New York. Political figures from the four states immediately became involved.

As mentioned earlier, after an unprecedented four rounds of design competition, McNamara overruled the military source selection board and awarded the TFX contract to General Dynamics on November 24, 1962. McNamara testified:

> My examination of the facts, in consultation with my advisors, convinced me that, as compared with the Boeing proposal the General Dynamics proposal was substantially closer to a single design, requiring only relatively minor modifications to adapt it to the different requirements of the Navy and the Air Force, and that it embodied a more realistic approach to the cost problem. Accordingly, I decided to select General Dynamics as the development contractor, since I concluded that it was best qualified to design the most effective airplane that could be produced at the least cost, in the least time, to meet our military requirements.[27]

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[27] Ibid.

for addition of later developed weapons. Performance based on a high degree on "commonality" of parts in the two versions of the aircraft to be built. The attempt to reduce of the two versions complex with the commonality design was the study for the Controversy, which ultimately

Early in 1951, the study for the TX-3 continued along to the major type. The Boeing Company at Seattle, Washington, changed to take the place at its plant in Wichita, Kansas. The General Dynamics Corporation of Fort Worth, Texas, cooperating with Grumman Aircraft Engineering Company of Bethpage, New York, planned to build the Air Force version in Texas and the Navy version in New York. Preliminary designs by four rivals immediately became available.

On December 1951, after an unprecedented four months of design competition, Lockheed overtook the military design competition board and awarded the TX-3 contract to General Dynamics on November 24, 1951. Watkins reported:

> My examination of the facts, in consultation with my advisors, convinced me that, as compared with the Boeing proposal the General Dynamics proposed was considerably closer to a simple design, requiring only relatively minor modifications to adapt it to the different requirements of the Navy and the Air Force, and that it embodied a more realistic approach to the cost problem. Accordingly, I decided to select General Dynamics as the development contractor, since I considered that it was best qualified to design the most effective airplane that could be produced at the least cost, in the least time, to meet our military requirements. [7]

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[7]Ibid.

In further explanation of the award, McNamara stated that the Source Selection Board, using factors weighted by judgment, made a recommendation which appeared to place greater emphasis on operational areas rather than on dependability of development and predictability of costs. He stated that this was not a case of military-civilian conflict but rather one of placing emphasis where it must be placed.[26]

Senator John L. McClellan, chairman of the Permanent Subcommittee on Investigations, was requested by Senator Jackson to inquire into the TFX contract. "The McClellan subcommittee investigators questioned witnesses, examined basic documents and established:

(1) The four service evaluations did favor Boeing.

(2) The Boeing price was $100 million lower on the first phase of the contract, and it might be $415 million lower on the total job.

(3) The Pentagon Source Selection Board, composed of top generals and admirals, was unanimous in its finding that the Boeing plane would be cheaper and better.

(4) The only document at the Pentagon that supported the General Dynamics plane was a five-page memorandum of justification, dated November 21, 1962. It was signed by McNamara; Eugene Zuckert, Secretary of the Air Force; and Fred Korth, Secretary of the Navy. (This document contained errors in arithmetic of

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[26] Ibid., pp. 387-388.

In further explanation of the award, McNamara stated that the Source Selection Board, using factors outlined by Zuckert, made a recommendation which appeared to place greater emphasis on operational areas rather than on responsibility of management and practicability of costs. He stated that this was not a case of military-civilian conflict but rather one of placing complete charge where it should be placed.

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Ibid., pp. 357-358.

$32 million and $22 million.)[29]

The McClellan investigators found conclusive evidence that the only cost studies available to McNamara contained substantial errors — errors of the magnitude of $290 million and $340 million. Further, that McNamara had made attempts in April, to reconstruct a record to establish justification for his decision six months earlier. Testimony already on file showed efforts to pressure career military men into changing their position and supporting McNamara, meanwhile the Pentagon generated documents and statistics to prove their decision. The one document the McClellan subcommittee needed was a file memorandum dated March 1, 1963, from Albert [illegible]. Blackburn, the key TFX technician in the Office of the Secretary of Defense. Blackburn, an aeronautical engineer and test pilot with an outstanding combat record, staffed the TFX program for two years and was, perhaps, "the best-informed man on TFX in America." When called to testify, he stated:

> There is no real, supportable case to be made for his /McNamara's/ choice of .../General Dynamics/ on the grounds of operations, technical management, or cost considerations. The Secretary /McNamara/ chose to make a decision on the basis of information different from that evaluated under the established ground rules.[30]

Senator McClellan initiated other studies and requested the GAC to make "an independent review of the cost standards prepared by the

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[29]Clark R. Mollenhoff, The Pentagon, (New York: G. P. Putnam's Sons, 1967), p. 300.

[30]Ibid., pp. 308-309.

[illegible]

The McClellan investigation [illegible] that the only [illegible] available to [illegible] — [illegible] of the magnitude of [illegible] Further, [illegible] to [illegible] justification for the decision [illegible] earlier. [illegible] on the [illegible] to [illegible] their position [illegible] McNamara, [illegible] generated [illegible] to [illegible] their decision. The [illegible] McClellan [illegible] memorandum dated March 1, 1963, from [illegible], [illegible] TFX technician in the Office of the Secretary of Defense, [illegible] and had [illegible] with [illegible] the TFX program for two years and [illegible]. The [illegible] on TFX in [illegible].[19] [illegible] as follows:

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[19]Clark R. Mollenhoff, The Pentagon, (New York: G. P. Putnam's Sons, 1967), p. 400.

[20]Ibid., pp. [illegible]-306.

Air Force and used by the Department of Defense in making its decision on the award of the contract." McClellan urged the GAO to make "careful distinction between figures available prior to the TFX award to General Dynamics and the after-the-fact studies.

On 26 April 1968, GAO replied: "We have found no independent or additional cost estimates covering the TFX program as a whole, and the Secretaries advise us that none exist ... Both Secretary McNamara and Secretary Tuckert have stated to us that the conclusions reached by them were on the basis of their judgment, rather than on independent /cost/ studies."[31]

The hearings on the TFX were suspended after the assassination of President Kennedy. However, in the fall of 1966, reports of scandalously high costs of the TFX project leaked out to renew the interest of Senator McClellan. "Pentagon secrecy had covered the details of costs, progress and performance on the F-111 warplanes, and frustrated the efforts of the McClellan ... Subcommittee. Defense Secretary McNamara exhibited the same reluctance to make detailed information on the F-111 costs and performance available to the Senate and House Armed Services Committees. Although there were periodic complaints and almost constant grumbling about McNamara's refusal to provide information for Congress, he rode through more than five years without

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[31] TFX Contract Investigation, Part 3, p. 661.

CIRC Confined Investigation, Part 4, p. 000.

a challenge to his exercise of the broadest arbitrary authority."[32]

At current estimates, the aircraft will cost approximately $9.6 million each, over three times the original estimate. The Navy version, now three years behind schedule and so grossly overweight as to allow little room for "growth," will be severely mission limited. Serious questions have been raised as to whether or not the Navy will procure any more than a "token" quantity. "Considering everything, McNamara's first major defense purchase doesn't now seem much of a bargain.[33]

The Nuclear Carrier

Coincident with the arrival of McNamara as Secretary of Defense, the Navy was faced with a serious problem of block obsolesence of the surface fleet. With relatively few exceptions, combatant surface ships had been built during WW II and were rapidly reaching the end of normal service life. In the period from 1954 to 1959, the Navy selectively modernized a number of these ships to extend service life while attempting to convince DOD of the necessity of a replacement shipbuilding program. In this same period, the Navy completed construction of three nuclear-powered surface warships: the aircraft carrier U.S.S. Enterprise, the cruiser U.S.S. Long Beach, and the guided-missile frigate U.S.S. Bainbridge. The success of the nuclear-powered surface

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[32]Mollenhoff, op. cit., pp. 322-323.

[33]Alexander, op. cit., p. 167.

a challenge to the exercise of the Executive [illegible] authority.[96]

At current estimates, the aircraft will cost approximately $[illegible] million each, over three times the original estimate. The [illegible] version, now three years behind schedule and so heavily overweight as to allow little room for "growth," will be severely limited [illegible]. Serious questions have been raised as to whether or not the Navy will procure any more than a token quantity. Consequently [illegible] first major weapons procurement [illegible] was [illegible] of [illegible].[97]

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[96] [illegible], op. cit., pp. [illegible].

[97] Alexander, op. cit., p. [illegible].

warships convinced the Navy of the increased effectiveness in mobility and flexibility gained over conventionally powered warships.

McNamara had rejected all starts on new construction of surface warships in his first two years in office, and was opposed to a nuclear-powered aircraft carrier on the basis of cost. The Navy persisted and included a request for a nuclear-powered carrier in the Fiscal Year 1963 budget. In spite of Congressional pressure, expert testimony, and public trial in newspaper and magazine articles, McNamara directed Secretary of the Navy, Fred Korth on October 9, 1962, to proceed with a conventional carrier. On the same date, Senator John Pastore, (Dem., R. I.), Chairman of the Joint Committee on Atomic Energy, wrote to McNamara calling attention to the published reports and reiterating the concern of the committee over the lack of information on plans for utilizing nuclear power and informing him that hearings were planned on the subject. Senator Pastore and members of his committee were unanimously in favor of the CVA-67 being nuclear-powered since it provided 'significant military advantages for surface warships.[34]

The hearings opened on October 30, 1962, Senator Pastore commented that the October 9 decision of McNamara 'was deliberately done to foreclose this committee from carrying out its responsibilities.

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[34]Report of the Joint Committee on Atomic Energy (Nuclear Propulsion for Naval Surface Vessils), December, 1962, 88th Congress, 1st Sess., p. 3.

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*Report of the Joint Committee on Atomic Energy (Nuclear Propulsion for Naval Surface Vessels), December, 1962, 88th Congress, 1st sess., p. 3.

... Now the only way you can cure this is by reversal, which is always much harder to do."[35]

The testimony solidly favored a nuclear carrier. Admiral David L. McDonald, Chief of Naval Operations, named to replace Admiral George Anderson, who was dropped after his testimony contradicted McNamara on the TFX contract,[36] testified:

> The military advantages demonstrated thus far, together with those which we confidently expect in the future, make it most desirable for us to proceed with the introduction of nuclear power into naval surface ships as rapidly as our budget will permit ... In this connection, the long range fiscal implications promise savings in the eventual reduction of oil storage, fleet oilers, and related logistics economics. While stating his personal preference, he added: We accept the Secretary of Defense's decision that it shall be conventionally propelled and concur in his belief that we must get on with the construction of this ship with minimum delay.[37]

Representative Melvin Price (Dem., Ill.) questioned Secretary Korth and Admiral McDonald concerning the statement of accepting the decision of the Secretary of Defense in order to avoid delay. "What would be the cause of delay in the event the Secretary had determined this would be a nuclear-powered carrier", Price asked.

"If he had determined, Congressman Price, that this was to be a nuclear carrier, we would proceed with dispatch," Korth replied. "We

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[35]Hearings before the Joint Committee on Atomic Energy (Nuclear Propulsion for Naval Surface Vessels), 88th Congress, 1st Sess., p. 20.

[36]Raymond, op. cit., p. 206.

[37]Hearings, "Nuclear Propulsion for Naval Surface Vessels," op. cit., p. 24.

Testimony before the Joint Committee on Atomic Energy (Nuclear Propulsion for Naval Surface Vessels), 84th Cong., 1st Sess., p. 80.

Gregg, loc. cit., p. 102.

"Hearings," Naval Propulsion for Naval Surface Vessels, op. cit., p. 34.

were unwilling to delay for further study of six months or any indeterminable time into the future a decision on whether it was to be nuclear or conventional."

"Then what would cause the delay?" Representative Price pressed to pin the responsibility.

"Only in presenting further facts to the Secretary of Defense to convince him that nuclear propulsion is a more appropriate means of propulsion than conventional," Navy Secretary Korth answered.[38]

Admiral Rickover testified:

> I think that cost-effectiveness studies are occasionally used to kill something — to kill it by studying it to death. The use of studies for this purpose is well known in Washington. The question of nuclear propulsion for the carrier John F. Kennedy /CVA-67/ is a good example.
>
> As we discussed earlier today, making the John F. Kennedy nuclear powered would have added substantially to the capability of the fleet. However, the decision on this ship was delayed a year while the Navy attempted to respond to a request to "undertake a comprehensive, quantitative study" of whether "the future Navy will, indeed, make full use of nuclear power." It was requested that the study "consider the design of the future carrier striking force in the broadest possible context." Questions were asked such as: How many escort vessels of what type should be included? Should ASW escort be provided in the conventional manner, or should it invision added emphasis on nuclear submarines. How is replenishment of aviation fuel and ordnance to be accomplished? Should the underway replenishment ships also be nuclear. How should the Navy be deployed around the world? Would nuclear power speak for a modification of the present concept of the 1st, 2nd, 6th and 7th Fleets? Realizing that we will have a large number of conventionally powered surface vessels in the inventory for sometime to come, how should we approach the ultimate design? What are the implications or force

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[38] Ibid.

size? Would nuclear propulsion allow us to reduce the total number of carriers and/or carrier task forces?

Each time one of these questions was answered, more were asked. The scope of these studies is so vast and vague that all participants could spend their lifetime at it.

As you know, a decision was finally made by the Department of Defense against putting nuclear propulsion in this carrier in order "to avoid further delay" in the construction of the ship. But is it really necessary to engage in cost-effectiveness studies on the whole future of the Navy before we can decide to put nuclear propulsion in a single ship?

Many situations arise where those who have a superior weapon will take an action they would not have taken with a weapon not so good. Factors such as these are not susceptible to computer analysis.[39]

In my opinion it is foolhardy to put in a propulsion plant which you have today when you know something else is better. If you are thinking twenty or thirty years from now, you cannot afford to put in obsolete equipment.[40]

When McNamara was called as a witness, he conceded the effectiveness of a nuclear-powered carrier, but contended that such a choice would not strengthen us in relation to the Russians. "I say this because with the total force we have available we are, in our opinion, completely protected against Soviet military and political pressure and we don't need additional forces."[41]

The Committee members did not think that the Soviets would stand still and reasoned that it was foolhardy to rely on conventional power in

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[39]Initial Memorandum, "Planning-Programming-Budgeting," U.S. Senate Subcommittee on National Security and International Operations, 90th Congress, 1st Sess., pp. 43-44.

[40]Report, "Nuclear Propulsion for Naval Surface Vessels," op. cit., p. 25.

[41]Hearings, "Nuclear Propulsion for Naval Surface Vessels," op. cit., p. 163.

Capehart, Charles Eugene. "Private-Sector Involvement in U.S. Food Cooperation." Ph.D. dissertation, Iowa State University, 1979.

Chapman, Duane. "Nuclear Proliferation for Almost Zero Profit." op. cit., p. 36.

Eldridge, Wallace Forrington. "Nuclear Proliferation for Almost Zero Profit." op. cit., p. 264.

a carrier destined to be in service for years. They charged McNamara was misinformed as to the performance advantages and the cost of a nuclear carrier. McNamara gave the committee cost figures that nuclear ships cost about two and one half times as much as conventional ships. The comparison was based on the costs of the first nuclear ships. Although figures were difficult to obtain from McNamara, he finally quoted a price of $440.4 million for the nuclear-powered ship against $277.2 million for the conventional carrier.

The Joint Committee pointed out:

> The Department of Defense overestimated the cost of nuclear propulsion for surface ships ... For example, it was claimed that a nuclear propelled carrier would be capable of carrying an additional squadron of aircraft. The purchase and operation costs /$87,400,000/ of the additional aircraft squadron were charged to the nuclear-propelled ship and used as a cost argument against nuclear propulsion. This nearly tripled the extra cost attributed to the nuclear carrier over its lifetime. Obviously, the additional costs are not related to nuclear propulsion and can be eliminated by not supplying the additional squadron of aircraft ... Also, in the construction of cost comparison, the initial reactor cores /$32,000,000/ which provide fuel for at least seven years, were charged against the cost of the nuclear carrier while no comparable fuel costs were attributed to the conventional carrier.[42]

It developed that if comparable costs were employed, the lifetime cost of the nuclear carrier, with all of its aircraft, was approximately three percent more than a conventional carrier similarly equipped. The Joint Committee declared; "It is apparent that the increased cost of nuclear power is not significant in relation to its demonstrated military

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[42]Report, "Nuclear Propulsion for Naval Surface Vessels," op. cit., p. 4.

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[42]Report, "Nuclear Propulsion for Naval Surface Vessels," op. cit., p. 4.

advantages."[43]

When McNamara was asked why he did not buy the best and most advanced aircraft carrier, he replied: "We don't buy the best there is in terms of technology in one of our weapons systems. We would be foolish if we bought the best ... in terms of speed and range and fire-power, when we don't need it ... We should buy only what we need and and what we need is usable effective combat power."[44]

The committee took strong exception to the above and asked McNamara what authorities, technical or military advised him to decide against nuclear propulsion in the new carrier? McNamara testified that he talked with Navy Secretary Fred Korth; Admiral David McDonald, Chief of Naval Operations, Captain (now Rear Admiral) Vincent P. de Poix, former commanding officer of the U.S.S. Enterprise; Dr. Glenn T. Seaborg, Chairman of the Atomic Energy Commission; and Vice Admiral Hyman G. Rickover, manager, Naval Reactors, Division of Reactor Development.

The Joint Committee noted in its report that: "All of the above mentioned persons testified to the committee that they had recommended that the new carrier be equipped with nuclear propulsion." Dr. Harold Brown, former Director of Defense Research and Engineering, conceded that all the military and technical men he knew "have taken an

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[43]Ibid.

[44]Hearings, "Nuclear Propulsion for Naval Surface Vessels, op. cit., p. 171.

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[illegible] when applications [illegible] only for [illegible] can exert
extended aircraft carrier, Dr. Brodie: "It [illegible] by the time there is
[illegible] of technology to one of our [illegible]-s. We cannot [illegible]
looking if we [illegible] . . . in terms of [illegible] and ready and there-
powers, when we don't need it . . . It [illegible] only [illegible] and
and what we need is [illegible] effective [illegible]."[47]

The [illegible] and [illegible] [illegible] in the [illegible] and [illegible]
[illegible] with [illegible], [illegible] of military [illegible] like to [illegible]
[illegible] nuclear [illegible] in the new [illegible]." [illegible] [illegible]
that he talked with Rear Admiral [illegible] Fred [illegible]; [illegible] [illegible],
Chief of Naval [illegible], Captain [illegible] [illegible]; [illegible],
Pole, [illegible] [illegible] officer [illegible] the U.S.S. [illegible], Lt. Glenn
T. [illegible], Chairman of the [illegible] Energy [illegible]; and Vice
Admiral [illegible] G. Hayward, [illegible], Naval Weapons, Division of
Reactor Development.

The Joint Committee added in its report that "All of the above
mentioned persons testified to the [illegible] that they had [illegible]
that the new carrier be equipped with nuclear propulsion." Dr. Harold
Brown, former Director of Defense Research and Engineering, suggested
that all the military and technical men be [illegible] [illegible] on

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[47]Ibid.

[48]Hearings, Nuclear Propulsion for Naval Surface Vessels,
op. cit., p. 17).

unequivocal position that there is no question at all about it that nuclear-propelled surface ships are much superior and have tremendous military advantages over conventional" ships.[45]

The committee report noted the lack of any real support for McNamara: "In summary, the committee still does not know of any qualified technical person or group who recommended to the Defense Department that nuclear propulsion not be installed in the new aircraft carrier."[46]

It appeared to be the rough judgment and intuition of McNamara against the technical experts and military men. Also, a McNamara decision apparently required no competent studies to support it.

> "On May 5, 1965, Representative William H. Bates (Rep., Mass.) told the House that according to Department of Defense cost studies, a conventional carrier is more expensive than a nuclear carrier when the cost of oilers are figured into the analysis. "This is borne out," he told colleagues, "in a detailed classified analysis submitted to the Joint Committee on Atomic Energy on January 13, 1965 by the Assistant Secretary of Defense, Mr. Charles J. Hitch."[47]
>
> By mid-1965, it was too late to correct what has been called a multi-million-dollar blunder. Representative Mendel Rivers (Dem., S.C.) chairman of the House Armed Services Committee, called the decision an error in judgment and reported that Admiral Rickover feels that progress on the U.S.S. John F. Kennedy now makes conversion to nuclear power too expensive. The damage had been done, and the U.S.S. John F. Kennedy was destined to travel the seas in the nuclear age dependent upon fuel

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[45]Ibid., p. 131.

[46]Report, "Nuclear Propulsion for Naval Surface Vessels," op. cit., p. 17.

[47]Mollenhoff, op. cit., p. 333.

[illegible] position that there is no question at all about it that nuclear-[illegible] warfare will be much superior [illegible] conventional weapons over conventional weapons.[46]

The committee report [illegible] the lack of any real support for [illegible]. "It is necessary, the committee felt, were not [illegible] qualified technical persons or [illegible] Congressmen [illegible] nuclear [illegible] and to [illegible] in the new [illegible] warfare."[47]

It appeared to [illegible] the Navy [illegible] and [illegible] weapons [illegible] the technical progress and military [illegible] Navy [illegible] seriously [illegible] adapted or [illegible] [illegible] it.

[illegible] (Rep., Ill.) told the House that according to [illegible] of Defense [illegible] studies, a conventional carrier is worth [illegible] than a nuclear carrier when the cost of [illegible] and [illegible] are figured [illegible] the analysis. "This is [illegible], he went [illegible]. "A detailed [illegible] analysis [illegible] by the Joint Committee [illegible] Atomic Energy on January 13, 1955, by the Assistant Secretary of Defense, Mr. Charles [illegible]. Bush."[48]

By mid-1955, it was too late to correct what [illegible] called a multi-million-dollar [illegible]. Representative [illegible] (Rep., N.C.) chairman of the House Armed Services Committee, called the decision an error in judgment and [illegible] that modified [illegible] final [illegible] on the [illegible] Kitty Hawk now [illegible] to [illegible] power [illegible]. The decision had been made, and the U.S.S. John F. Kennedy was destined to [illegible] the name in the aircraft-carrier [illegible].

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[46]Ibid., p. 127.

[47]Hedgepeth, "Nuclear Propulsion for Naval Surface Vessels," op. cit., p. 17.

[48]Hedgepeth, op. cit., p. 127.

from a fleet of oilers — an "obsolete" monument to the McNamara reign at the Pentagon. Representative Chet Holifield (Dem., Cal.) vice chairman of the Joint Committee on Atomic Energy, in an exchange of letters with Rivers pointed out that "the only new surface warship authorized for our naval striking force in the 1963, 1964, 1965, and 1966 programs is the aircraft carrier ... U.S.S. John F. Kennedy.[48]

Klaus Knorr, Director, Center of International Studies, Princeton University, reviewing the testimony wrote:

> I read with care McNamara's 1963 testimony on why he preferred a conventional-fuel to a nuclear-fuel aircraft carrier. In his very lengthy testimony, McNamara came back again and again to the difference in money costs but, though several senators pressed him with intelligent and pertinent questions, he never explained why the advantages of the nuclear carrier were not worth the difference in these costs. He contented himself with stating flatly that he did not think they were, while citing eagerly and at length some dubious analogies: why he personally was better off buying a medium-price rather than a high-price automobile; why a farmer, having to transport produce to the market from time to time, might be better off with a cheaper and slower truck rather than with a speedier and more expensive one. The trouble with these analogies is that they explain the cost-effectiveness principle — especially, a stripped-down version of it — but they do not explain at all the superiority, as a buy, of a conventional over a nuclear carrier. Obviously, Secretary McNamara has far better information on the factors affecting his choice of automobile than he could possibly have about the future utility of different aircraft carriers in different contingencies whose probabilities are unpredictable. He also could easily make some simple assumption about the hypothetical farmer's transportation problem, but similar assumptions about the future missions of aircraft carriers are more difficult to make. I had the strong impression that the money-cost difference and the stripped-down cost-effectiveness model were foremost in the Secretary's mind, and that the very complicated guesswork on possible demands on aircraft carriers some years hence was not.[49]

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[48] Ibid.

[49] Initial Memorandum, "Planning-Programming-Budgeting," op. cit., pp. 19-20.

Epilogue

The examples cited are only two decisions of many which came under Congressional investigation during the McNamara regime. Almost without exception, the pattern was repeated. Information upon which the decision was based was inaccurate, not available, classified, based on improper assumptions, or biased by subjective views of the future. Money costs predominated the decision process and effectiveness was given little attention. The judgment of technical and military advisers was held secondary to that of the cost analysts of the Department of Defense, and sufficient evidence exists of efforts to intimidate or stifle criticism within DOD and to justify decisions, after the fact, with cost-effectiveness studies.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

"To expect, however, that the method itself (which distributes indulgences to some and deprivations to others) would not be subject to manipulation in the political process is to say that we shall be governed by formula and not by men." -- Wildavsky[1]

Retrospect

In a reign extending just over seven years, Robert S. McNamara brought about two major revolutions in the Department of Defense. He redesigned the military strategy and forces of the United States, and, at the same time, he installed an entirely new method of making defense decisions. To appreciate the magnitude and scope of such a task, one need only look at the size and complexity of the Department of Defense and its history of resistance to change. The system which utilizes systems analysis or cost-effectiveness studies to evaluate alternative means of accomplishing objectives within the Planning-Programming-Budgeting framework has been applied to six defense budgets — Fiscal Years 1963 through 1968. The speed and efficiency with which the new

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[1]Aaron Wildavsky, The Politics of the Budgetary Process, (Boston: Little Brown & Co., Inc., 1964), p. 159.

(Boston: Little Brown & Co., Inc., 1964), p. 186.

system was installed belies the risks and dangers as well as the opportunities in trying to move too far too fast in the application of new management techniques. The costs in lowered service morale, delayed acquisition of weapon systems, and Congressional concern are indicative that the benefits of PPB and systems analysis may have oversold by its proponents. The most significant result of the new techniques may be the increased power given to the Secretary of Defense which in turn, breeds fear that such a centralization of authority will silence the voices of dissent and reduce arguments that must be offered and heard.

Much of the unification of the services — and thus centralization of authority — has been made inevitable by the technological changes in weapons and the consequent changes in force structure.[2] McNamara acknowledged that Defense never lost track of deciding what was needed for national security and buying it at the lowest sound price, without regard to arbitrary budget ceilings or other factors. Concurrently, however, he stated: "On many, if not most of the tasks of the Department we can place some form of statistical measure and operate more effectively because of it."[3] Inherent in the McNamara method was transfer of the real decisionmaking power from the military heads of the services to the Secretary of Defense.

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[2]Raymond, op. cit., p. 298.

[3]Robert S. McNamara, "Vietnam Is The Proof of Theory," Armed Forces Management, Vol. 13, No. 1 (October 1966), p. 44.

Huntington, op. cit., p. 194.

Robert L. Heilbroner, "Reflections on the Logic of Strategy," Armed Forces Management, Vol. 15, No. 1 (October 1968), p. 44.

"The services had a direct confrontation with McNamara's analysts for the first time in 1962, and the result was a nearly wholesale rejection of the service proposals. From that year, unfortunately, the analytic process has often been associated with the refutation of service arguments rather than with the initiation and channeling of continued change."[4] Professional judgment or scientific hunch was downgraded for perfection on paper and the "cost" part of the "cost-effectiveness formula" slowed the pace of military development.[5] Before the services developed an expertise in cost-effectiveness techniques, they tried the piecemeal approach or soft-sell unsucessfully, so they tried asking for less and received even less. As an example, in 1963, the Army asked for half the helicopters it thought it needed for the air-cavalry divisions and received half of what it asked for. Again in 1965, the Army asked for more helicopters for the Vietnam fighting and saw its request severely cut. Subsequently, McNamara had to ask for a supplemental appropriation for additional aircraft and helicopters in 1966 with the attendant higher price and lead time lost from the delayed decision.[6]

"The PPB approach was used to justify the purchase of a $277 million oil-fueled aircraft carrier that was obsolete before it was

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[4]Enke, op. cit., p. 10.

[5]Hanson W. Baldwin, "Slowdown at the Pentagon," Foreign Affairs, Vol. 43, Nos. 1-4 (October 1964 to July 1965), p. 363.

[6]C. W. Borklund, "Cost Effectiveness vs. Creativity: Part I," Armed Forces Management, Vol. 13, No. 11 (August 1967), p. 53.

"The services had a direct confrontation with McNamara's analysts for the first time in 1961, and the result was a nearly wholesale rejection of the service proposals. Then, but rarely subsequently, the analytic process had often been associated with the rejection of service arguments rather than with the selection and championing of continual change."[1] Professional judgment or scientific study [illegible] for perfection on paper and the "cost" part of the "cost-effectiveness formula" worked against the goal of military improvement.[2] Since the services developed an expertise in cost-effectiveness techniques, they [illegible] technical approach to software requirements, so they have become far less [illegible] like the Pentagon ones later. As an example, in 1961 the Army asked for half the helicopters it thought it needed for its air-mobility divisions and received half of what it asked for. Again in 1965, the Army asked for other helicopters for the Vietnam conflict and only [illegible] apparently [illegible] out. Subsequently, McNamara had to ask for a supplemental appropriation for additional aircraft and helicopters in 1966 with the statement [illegible] from the delayed decision.[3]

"The cost-effectiveness approach was used to justify the purchase of a [illegible] million oil-fired aircraft carrier that was obsolete before it was

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[1]Beaton, op. cit., p. 10.

[2]Hanson W. Baldwin, "Slaughter at the Pentagon," Foreign Affairs, Vol. 45, Nos. 1-4 (October 1966 to July 1967), p. 265.

[3]C. W. Borklund, "Cost Effectiveness vs. Judgment: Part I," Armed Forces Management, Vol. 13, No. 11 (August 1967), p. 56.

launched. Also, a perversion of cost-effectiveness was used, after the fact, in the largest single military aircraft contract in history, to rationalize the choice of an airplane whose costs are soaring, if not its performance ... Cost-effectiveness study, like any other management tool, can be misused — to becloud rather than eluminate judgment in the Executive Branch and Congress."[7]

This paper, in reviewing the role of systems analysis within the decision framework of PPB by examining the literature and testimony recording several of the more controversial decisions, set out to establish safeguards to assure that the new management techniques do not displace, rather than aid conventional military wisdom with a systematized logic. In the process, several conclusions and recommendations were reached and are offered in an attempt to focus attention on areas the writer considers most important.

Conclusions

The centralization of decisionmaking regarding the total defense budget and its allocation among missions is the key element of the present DOD management process. Although it may be necessary for effective civilian control of the military establishment, the degree or extent of control is a matter of style. In a small organization complete centralization may not be detrimental. In a large, more complex

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[7]Initial Memorandum, "Planning-Programming-Budgeting," op. cit., pp. 3-4.

Conclusion

The [illegible] of the computer [illegible] the [illegible]
[illegible] and its diffusion [illegible] [illegible] [illegible]
increase [illegible] management crucial. [illegible] [illegible]
effective [illegible] control of the [illegible] [illegible] [illegible]
control of control [illegible] a result of style. [illegible]
centralization may not be detrimental. In a [illegible]

[illegible] Management, "Centralized-Decentralized Dilemma", [illegible]
pp. 3-4.

atmosphere such as DOD the morale and judgment of lower level managers may well be eroded.

In preparation of the 1965 budget, McNamara is said to have made in excess of 500 decisions.[8] Such a high degree of centralization cannot help but slow the decision process. Considering that McNamara required full justification of any change proposal including forces, costs, manpower, procurement, schedules, and financing considered appropriate to the evaluation, enormous investment of time and manpower were required even to submit a PCR. Review of the PCR process in 1966 indicated that nearly 50% of the proposals were rejected or substantially changed.[9] It can easily be seen that unpopular proposals can be endlessly rejected until the sponsor realizes that he has no recourse. If the top decisionmaker has one view of the future and one set of value judgments, only proposals meeting these criteria will be acceptable.

Under McNamara, decision "thresholds" were established. For new programs, the "thresholds" were absolute; all requests had to be submitted. This often led to a circular dilemma. Since inventions cannot be predicted, neither can their costs, which makes them high-risk projects. Without tangible cost figures, such high-risk projects

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[8]Raymond, op. cit., p. 289.

[9]McKinsey and Company, Inc., Management Consultants, "Preliminary Study of the Defense Department Management Planning Process," Memorandum to the Assistant Secretary of Defense (Comptroller) dated January 5, 1966, p. 3.

risk projects. Without funding from the government, such high-risk projects

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Peterson, op. cit., p. 000.

Blackburn and Company, Inc., Management Consultants, Preliminary Study of the Cadmium Inventory Management Planning Process, (Memorandum to the Assistant Secretary of Defense (Comptroller) dated January 6, 1960, p. 3.

cannot compete against proven systems, where costs and benefits are known. Although decision "thresholds" are not sacred, they should be established with sufficient latitude that lower level innovation is not stifled and realistically determined so that top management can allot time to the really key decisions.

Analysis is necessarily incomplete. Every system analysis has its defects. Some of these are limitations inherent in all analyses of choice. Others are the consequence of the difficulty or complexity of the question. The difficulty in predicting the future alone is sufficient reason to question how far one should go in hedging against uncertainty. Analytical techniques can focus the issues, but no mechanical aid can substitute for intuition and judgment.

Analysis is incomplete if for no other reason than the time and money which can be allotted to it. The annual budget cycle, itself, induces a discipline and current experience has shown that over 30% of change proposals are "folded" into the annual budget review without prior screening by the Office of Systems Analysis.

The development of the systems analysis cult is not without its negative aspects. The powers of insight of the natural scientist and the economist have certainly been overrated. From special knowledge in one specific, admittedly difficult field, popular opinion has concluded they are omniscient. The military has abdicated, too readily in many cases, before sophisticated discussions of strategic problems by civilian

military analysts. Even if the system requires that all problems of armament, equipment and deployment be supported by scientific analysis, the final decision on what is to be achieved, when and how, is one of leadership, and not of science. It would be a grave mistake to believe that strategic theory can replace strategy.[10]

Private writing on strategic subjects will not easily reach and influence the strategic decisionmaker, but it readily reaches the advisers and specialists on the staff, since they generally belong to the same generation and intellectual groups as the writers in universities and institutes. From the advisory level, it may gradually penetrate the highest policy-making circles.[11] Within the military, there has hardly been a writer of note on military strategy since the turn of the century when Admiral Alfred Thayer Mahan was dominant. There have been many views from the civilian side of the house recently, but few from military strategists, however brilliant. Although the military is not in the "publish or perish" school, if influential and timely thoughts are not recorded, they soon evaporate.

Congress must continue to assert its right to investigate. Closely allied to this is the thought that the military must not become so intimidated that they fear to testify. The voice of dissent must be raised to preclude corruption, mismanagement and waste of resources. It is

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[10]Schwarz, op. cit., p. 161.

[11]Ibid., p. 131.

military analysis. Even if the system requires that all decisions of importance, including not only those required by emergency or unexpected circumstances but also those of routine character, be made by the dual executive as such is to be expected, there will not, in fact or theory, be any role of consent. It would be a gross distortion to believe that absolute power has replaced consent.[1]

Private control on scientific research will not simply result in influence the scientific establishment but it could result in military and specialists in the sense that they control access to the basic information and intellectual process on the strength of which the scientific and technical progress depends. Given the military need, a new technological dependence would be created.[2] Unlike the military, which has come a regular or part of military thought since the days of the ancient Greek city-states, the scientific community has not been accustomed to the role of consent. There have been many times when the scientific role of the state previously, but for them military associated, however difficult. Whether the military is out of the public or private school, if technological and timely decisions are not received, they lose importance.

Scientific must continue to accept the role of technocrats. Closely allied to this is the belief that the military must not become so interested that they lose to reality. The role of dissent must be preserved, to preclude corruption, bureaucratization and lack of responsiveness. It is

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[1] Rosenberg, op. cit., p. 40.

[2] Ibid., p. 111.

recognized that only mutiny and chaos would prevail if every military member were to protest in a manner similar to Admiral Rickover or General Billy Mitchell, but where national security is at stake, these issues must be raised. No one man, even one as admittedly brilliant as McNamara, is infallible. Decisions on the balance of forces and complex weapon systems need divergent viewpoints.

The power centralized in the Pentagon is a useful power, an essential power in the world in which we live. But it is a dangerous power, which carries with it the seeds for destruction of our political institutions and our way of life. It needs examination, constant investigation and criticism from within and from without. It needs to be curbed periodically and above all it requires dissent.

BIBLIOGRAPHY

Public Documents

———————. Public Papers of the Presidents of the United States, Harry S. Truman, 1945. "Special Message to the Congress Recommending the Establishment of a Department of National Defense. December 19, 1945."

U.S. Congress, Report of the Special Preparedness Subcommittee of the Senate Armed Services Committee. (Military Cold War Education and Speech Review Policies). 87th Congress, 2d Session, 1962.

U.S. Congress, Hearings, TFX Contract Investigation. Permanent Subcommittee on Investigations, Senate Committee on Government Operations. 88th Congress, 1st Sess., March, 1963.

U.S. Congress, Robert S. McNamara, Testimony before the Subcommittee on Defense Procurement of the Joint Economic Committee of Congress, March 26, 1963.

U.S. Congress, Report of the Joint Committee on Atomic Energy. (Nuclear Propulsion for Naval Surface Vessels). 88th Congress, 1st Sess., December, 1963.

U.S. Congress, Alain C. Enthoven, "The Systems Analysis Approach." (Presentation prepared for the Special Subcommittee on the Utilization of Scientific Manpower, Senate Labor and Public Welfare Committee). 89th Congress, 2d Session, May 17, 1966.

U.S. Congress, Initial Memorandum. Planning-Programming-Budgeting. U.S. Senate Subcommittee on National Security and International Operations. 90th Congress, 1st Session.

U.S. Congress, Senate Subcommittee of the Committee on Government Operations. Hearings, Planning-Programming-Budgeting. 90th Cong., 1st Sess., August 23, 1967. Testimony presented by Charles L. Schultze.

BIBLIOGRAPHY

Public Documents

_____. Public Papers of the Presidents of the United States, Harry S. Truman, 1948. Message to the Congress Recommending the Establishment of a Department of National Defense. December 19, 1947.

U.S. Congress. Report of the Special Congressional Committee to Investigate Executive Agencies. Washington, D.C.: Government Printing Office, 1947.

U.S. Congress. Hearings, 77th Congress 1st Session. Permanent Committee on Territories. House Committee on Government Operations. 77th Congress, 1st Sess., Washington, 1941.

U.S. Congress. Report to Congress, Two Billion Dollar Economy. (Twenty-Second Report for the Period January 1 to December 31, 1946). 80th Congress, 1st Sess., December, 1947.

U.S. Congress, Alaia C. Galloway, The Alaska Railroad. (Preparation prepared for the Special Subcommittee on the Utilization of Scientific Manpower, Committee on Public Works Committee). 80th Congress, 2d Session, May 17, 1948.

U.S. Congress, Joint Committee. Planning-Programming-Budgeting. U.S. Senate Subcommittee on National Security and International Operations. 90th Congress, 1st Session.

U.S. Congress, Senate Subcommittee of the Committee on Government Operation. Reorganizing-Executive-Departments. 80th Cong., 1st Sess., August 15, 1947. Testimony presented by Charles L. Schultze.

U.S. Congress, Senate Subcommittee of the Committee on Government Operations. Hearings, Planning-Programming-Budgeting. 90th Cong., 1st Sess., 1967.

Books

Burkhead, Jesse. Government Budgeting. New York: John Wiley & Sons, Inc., 1956.

Enke, Stephen. Defense Management. Endlewood Cliffs, N.J.: Prentice-Hall, 1967.

Hitch, Charles J. Decision-Making for Defense. Berkeley and Los Angeles, Calif.: University of California Press, 1965.

Kaufmann, William W. The McNamara Strategy. New York: Harper & Row, Publishers, 1964.

Mollenhoff, Clark R. The Pentagon. New York: G. P. Putnam's Sons, 1967.

Novick, David (ed.). Program Budgeting: Program Analysis and the Federal Budget. A RAND Corporation publication. Washington: U.S. Government Printing Office, 1965.

Schwarz, Urs. American Strategy: A New Perspective. New York: Doubleday & Company, Inc., 1966.

Taylor, Maxwell D. The Uncertain Trumpet. New York: Harper and Bros., 1959.

Tucker, Samuel A. (ed.) A Modern Design for Defense Decision. "A McNamara-Hitch-Enthoven Anthology." Washington, D.C.: Industrial College of the Armed Forces, 1966.

Wildavsky, Aaron. The Politics of the Budgetary Process. Boston: Little Brown & Co., Inc., 1964.

Articles and Periodicals

Alexander, Tom. "McNamara's Expensive Economy Plane, Fortune, (June 1, 1967), p. 90.

U.S. Congress, House Subcommittee of the Committee on Commerce. Consumer Protection and Economic Advisory Powers. Washington, D.C.: U.S. Govt. Print. Off., 1966.

Books

Burnham, James. Congress and American Tradition. New York: John Day Company, Inc., 1959.

Cohn, Stephen. Congress Unconquered. Garden City, N.Y.: Doubleday, 1967.

Dahl, Robert A. Congress and Foreign Policy. New York: Harcourt, Brace, 1950.

Eidenberg, Eugene, and Roy D. Morey. An Act of Congress. New York: W. W. Norton & Co., Inc., 1969.

Fenno, Richard F., Jr. The Power of the Purse. Boston: Little, Brown and Co., 1966.

Galloway, George B. Congress at the Crossroads. New York: Thomas Y. Crowell Co., 1946.

Goodman, Walter. A Percentage for the Senator. New York: Farrar, Straus and Giroux, 1970.

Griffith, Ernest S. Congress: Its Contemporary Role. New York: New York University Press, 1961.

Hall, Leonard W. Congress and Its Critics. Chapel Hill: University of North Carolina Press, 1944.

Hamilton, Walton H. Congress at Work. New York: Henry Holt and Co., 1952.

Hardeman, D. B., and Donald C. Bacon. Rayburn: A Biography. Austin: Texas Monthly Press, 1987.

Hinckley, Barbara. Stability and Change in Congress. New York: Harper & Row, 1971.

Huitt, Ralph K., and Robert L. Peabody. Congress: Two Decades of Analysis. New York: Harper & Row, 1969.

Jones, Charles O. Every Second Year: Congressional Behavior and the Two-Year Term. Washington, D.C.: The Brookings Institution, 1967.

Kefauver, Estes. In A Few Hands: Monopoly Power in America. Baltimore: Penguin Books, Inc., 1965.

Kelly, Sean J. Congress Looks at Its Records. New York: Praeger Publishers, 1970.

Kofmehl, Kenneth. Congressional Investigative Committees. Baltimore: The Johns Hopkins Press, 1962.

Lindblom, Charles E. Intelligence of Democracy. New York: The Free Press, 1965.

Lowi, Theodore J. The Politics of Disorder. New York: Basic Books, Inc., 1971.

Lowi, Theodore J. The End of Liberalism. New York: W. W. Norton & Co., Inc., 1969.

Lowi, Theodore J. At the Pleasure of the Mayor. New York: The Free Press of Glencoe, 1964.

Lowi, Theodore J. The Public Philosophy: Interest-Group Liberalism. New York: W. W. Norton & Co., Inc., 1967.

Lowi, Theodore J. The Politics of Disorder. New York: Basic Books, Inc., 1971.

Lowi, Theodore J. The End of Liberalism. New York: W. W. Norton & Co., Inc., 1969.

Lowi, Theodore J. At the Pleasure of the Mayor. New York: The Free Press of Glencoe, 1964.

Lowi, Theodore J. The Public Philosophy: Interest-Group Liberalism. New York: W. W. Norton & Co., Inc., 1967.

Articles and Periodicals

Alexander, Thos. "Sectionalism's Strongest Lobbyist." Florida Historical Quarterly, Volume L, [1971], p. 20.

Alsop, Stuart. "After 7 Years, A Farewell to McNamara," The Washington Post, (March 3, 1968), p. B2.

Baldwin, Hanson W. "McNamara's Monarchy," Saturday Evening Post, (March 9, 1968), p. 8.

Baldwin, Hanson W. "Slowdown at the Pentagon," Foreign Affairs, Vol. 43, Nos. 1-4 (October, 1964 to July, 1965), p. 263.

Borklund, C. W. "Cost-Effectiveness vs. Creativity: Part I," Armed Forces Management, Vol. 13, No. 11 (August, 1967), p. 52.

Borklund, C. W. "Cost-Effectiveness vs. Creativity: Part II." Armed Forces Management, (September, 1967), p. 58.

Borklund, C. W. "Is the U.S. Already Embarked On Unilateral Disarmament?", Armed Forces Management, (November, 1967), p. 76.

Greenhouse, Samuel M. "The Planning-Programming-Budgeting System: Rationale, Language, and Idea-Relationships," Public Administration Review, (December, 1966), p. 276.

McNamara, Robert S. "Vietnam Is The Proof of Theory," Armed Forces Management, Vol. 13, No. 1 (October, 1966), p. 44.

Murray, Russell. Deputy Assistant Secretary of Defense for General Purpose Programs (Systems Analysis), "Systems Analysis and Cost Effectiveness," Defense Industry Bulletin, II, No. 9 (September, 1966), 1.

Schick, Allen. The Road to PPB: The Stages of Budget Reform," Public Administration Review, (December, 1966), p. 243.

Seligman, David. "McNamara's Management Revolution," Fortune, (July, 1965), pp. 116-120 and 246-250.

Sheehan, Neil. "You Don't Know Where Johnson Ends and McNamara Begins," The New York Times Magazine, (October 22, 1967), p. 131.

Smalter, Donald J. and Ruggles, Rudy L. Jr. "Six Business Lessons from the Pentagon," Harvard Business Review, Vol. 44, No. 2 (March-April, 1966), p. 71.

Whalen, Richard J. "The Shifting Equation of Nuclear Defense," Fortune, (June 1, 1967), p. 86.

Wildavsky, Aaron. "The Political Economy of Efficiency: Cost-Benefit Analysis, Systems Analysis, and Program Budgeting," Public Administration Review, (December, 1966), p. 292.

Reports

Croke, Paul V., et al. "Lessons Learned from Contract Definition." Boston: Peat Marwick Management Systems Company, 1965.

Dordick, H. S. An Introduction to System Effectiveness. The RAND Corporation, 1965.

Fisher, G. H. The World of Program Budgeting. Santa Monica: The RAND Corporation, 1966.

Jones, M. V. "System Cost Analysis: A Management Tool for Decision Making." Bedford, Massachusetts: The Mitre Coropration, 1965.

Kahn, Herman, and Mann, Irwin. Ten Common Pitfalls. Santa Monica: The RAND Corporation, 1957.

Knorr, Klaus. "On the Cost-Effectiveness Approach to Military R & D: A Critique." Santa Monica: The RAND Corporation, 1966.

Novick, David. New Tools For Planners and Programmers. Santa Monica: The RAND Corporation, 1960.

Novick, David. Origin and History of Program Budgeting. Santa Monica: The RAND Corporation, 1966.

Quade, E. S. (ed.) Analysis for Military Decisions. Santa Monica: The RAND Corporation, 1964.

Quade, E. S. Cost Effectiveness: An Introduction and Overview. Santa Monica: The RAND Corporation, 1965.

Quade, E. S. Some Comments on Cost-Effectiveness. Santa Monica: The RAND Corporation, 1965.

Brown, Richard J. "The Waiting Equation of Nonlinear Decision," Fortune (June 1, 1957), p. 45.

Mahoney, Aaron. "The Petition Economy of Attorney: Cost-Benefit Analysis, System Analysis, and Program Budgeting," Public Administration Review (December, 1968), p. 36.

Reports:

Cronk, Paul V., et al. Reasons Learned from Combined Evaluation. London: Rand Marvick Management Systems Company, 1968.

Cordick, R. S. An Introduction to Computer Efficiencies. The RAND Corporation, 1967.

Fisher, G. H. The Cost of Program Budgeting. Santa Monica: RAND Corporation, 1968.

James, M. V. Systems Cost Control: A Management Tool for Decision Making. Boston: Harvard Business School, The Rand Corporation, 1967.

Klein, Herman, and Quinn, Orville. Cost Comparison Principle. Santa Monica: The RAND Corporation, 1967.

Knorr, Klaus. On the Cost-Effectiveness Approach to Military R & D Decisions. Santa Monica: The RAND Corporation, 1967.

Novick, David. New Tools for Planning and Control. Santa Monica: The RAND Corporation, 1969.

Novick, David. Costing and Pricing of Research Projects. Santa Monica: The RAND Corporation, 1968.

Quade, E. S. (ed.) Analysis for Military Decisions. Santa Monica: The RAND Corporation, 1964.

Quade, E. S. Cost Effectiveness for Introduction and Overview. Santa Monica: The RAND Corporation, 1967.

Quade, E. S. Some Comments on Cost-Effectiveness. Santa Monica: The RAND Corporation, 1968.

Quade, E. S. Some Problems Associated with Systems Analysis. Santa Monica: The RAND Corporation, 1966.

Rowan, Thomas C. Systems Analysis: Problems, Progress, and Potential. Santa Monica: Systems Development Corporation, 1966.

Other Sources

McKinsey and Company, Inc., Management Consultants. "Preliminary Study of the Defense Department Management Planning Process." Memorandum to the Assistant Secretary of Defense (Comptroller) dated January 5, 1966.

U. S. Department of Defense. "Proposal Evaluation and Source Selection," DCD Directive 4105.62. April 6, 1965.

U. S. Department of Defense. "Study Report on the Programming System for the Office of the Secretary of Defense." Washington: Office of the Assistant Secretary of Defense (Comptroller). June 25, 1962.

U. S. Department of the Navy. "The Navy Programming Manuel." Office of the Chief of Naval Operations, (OPNAV 90P-1). June 11, 1965 and changes.

Chase, G. C. Some Lectures Presented with Systems Analysis. [illegible] Rand Corporation, 1965.

Rowan, Thomas C. [illegible] Problems, Principles, and Techniques. [illegible] Rand Corporation, Operations, 1966.

[illegible]

McKinsey and Company, Inc., Management Consulting. "Evaluation Study of the Defense Department Management Command Procedures. Memorandum to the Assistant Secretary of Defense (Comptroller) Dated January 8, 1968.

U. S. Department of Defense. Proposal Evaluation and Source Selection," DOD Directive 4115.1C. April 8, 1965.

U. S. Department of Defense. "Study Report on the Preparation, Review and Use of the Program of the Secretary of Defense." Memorandum Office of the Assistant Secretary of Defense (Comptroller). June 21, 1965.

U.S. Department of the Navy. "The Navy Procurement Manual." Office of the Chief of Naval Operations. [illegible] June 11, 1965 and revised.

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